

## DOCTORAL THESIS

### The Role of Positive Schizotypy and Traumatic Life Events in the Emotional Content of Experimentally Induced False Perceptions

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**The Role of Positive Schizotypy and Traumatic  
Life Events in the Emotional Content of  
Experimentally Induced False Perceptions**

by

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A thesis submitted in partial fulfilment of the  
requirements for the degree of PsychD

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## **Abstract**

Background: Positive schizotypy describes unusual perceptual experiences (such as hallucinations) and beliefs (such a delusional-like thinking) akin to those observed in schizophrenia. Previous evidence has suggested that positive schizotypy can predict false perceptual experiences in non-clinical participants during experimental tasks involving visual detection of fast moving words. However, little is known about the role of emotion as well as the emotional content of such laboratory-generated, false perceptual experiences. Furthermore, despite previous evidence on an association between schizotypy and traumatic life events, it remains unclear whether such traumatic life events would also have an impact on the number and content of laboratory-generated false perceptions.

Aims: The aims were to replicate previous findings that positive schizotypy is a predictor of false perceptions (perceptual bias) in a word recognition task and to extend this in a number of novel ways: investigate false perceptions as a function of schizotypy under different conditions through experimentally manipulating the emotional content of target words; examine the emotional content of such false perceptual experiences; and examine the role of schizotypy and traumatic life events in the amount and the content of false perceptions, while controlling for subclinical traits anxiety and depression.

Method: In Study I, a non-clinical sample (N = 121) completed standard psychological questionnaires and undertook a word detection task where a series of target words (of four emotional conditions: positive, neutral, threat-related, or trauma-related) or non-words were briefly displayed on a computer screen. The participants identified any target words they saw. Some reported false perceptions,

i.e. words that were not among the target words. In Study II, professional therapists (N = 12) and non-therapists (N = 12) rated the emotional content of the false perceptions according to standard scales for emotional intensity and valence.

Results: Positive schizotypy was a predictor of the number of false perceptions in line with previous findings. Participants reported fewer correct responses in the threat-related and trauma-related target word conditions than in the neutral and positive conditions. Furthermore, associations were found between positive schizotypy and emotional content (Emotional Intensity, Activity and Potency) of false perceptions as well as between positive schizotypy, early-age trauma and depression.

Conclusions: These findings suggest that individuals with positive schizotypy are more likely to experience false perceptions and that their false perceptions have a higher emotional content. The results also confirm previous findings that negative emotion may interfere with perceptual and/or cognitive processes, and that early-age trauma may be a risk factor for schizotypy.

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# Introduction

The primary focus of the present studies was to investigate the association between schizotypy and the emotional content of false perceptions reported by non-clinical participants during a word recognition task.

In addition, the studies investigated possible associations between the false perceptions and any early-age trauma experienced by the participants who reported them, or the participants' levels of anxiety and depression. The studies also provided the opportunity to test the effect of negative emotional condition on the participants' responses in the word recognition task, and to look for differences between therapists and non-therapists in how they rated the emotional content of words.

One dimension of how schizotypy can be understood is as an index of an individual's underlying vulnerability to developing psychosis (Meehl, 1990). Schizotypy is characterised by a broad range of symptoms and traits generally categorised as 'positive' (such as unusual beliefs and perceptions), 'negative' (such as avolition and asociality) and 'disorganised' (disorganised thought and speech patterns). There is evidence to suggest that schizotypal traits are common in the general population (van & Merckelbach, 2003) where they may manifest as oddities of belief, ideas, speech or behaviour, and social awkwardness or aversion (Siever, Kalus & Keefe, 1993). The study of schizotypy has importance in improving the understanding of factors that may underlie schizophrenia and psychosis, and Chapter 1 of this thesis discusses schizotypy and its relationship with these factors. Chapters 2 and 3 then consider schizotypy with respect to cognitive and perceptual bias, and schizotypy's relationship with emotion and life experience.

Previous studies using a word recognition task have demonstrated that positive schizotypy is associated with a tendency to report false perceptions—i.e. stimuli that are not displayed to the participant (Cella, Taylor & Reed, 2007; Coy & Hutton, 2012; Colbert, Peters & Garety, 2010; Barkus, Smallman, Royle, Barkus, Lewis & Rushe, 2011)—independent of task order, impulsivity and social desirability (Tsakanikos & Reed, 2005a), with this persisting after controlling for trait anxiety, depression and delusional ideation (Reed, Wakefield, Harris, Parry, Cella & Tsakanikos, 2008). The present studies use a similar word recognition task but go further and consider the emotional content of the false perceptions reported.

In Study I, 130 non-clinical participants completed online questionnaires that assessed their levels of positive schizotypy, early-age trauma and life events, anxiety and depression. This was followed by a word recognition task in which target words and non-words of a similar length were displayed briefly on a computer screen. The participant was asked to read out loud any word they saw. This occasionally resulted in participants reporting false perceptions, i.e. words that had not been displayed. The participants' correct, incorrect and false perception responses were recorded and analysed. This study and its results are described in Chapter 4.

In Study II, 12 counselling and psychotherapy practitioners and a control group of 12 non-therapists were asked to rate each target word and false perception from Study I for its emotional content, using standard scales. The ratings given by the therapists and non-therapists were compared. The mean emotional content rating for the false perceptions were then linked with the Study I data of the participants who had reported them. This allowed the investigation of possible correlations between the emotional content of the false perceptions and the participants' positive schizotypy,

early-age trauma, anxiety and depression scores. Study II is described in Chapter 5 and the overall conclusions from both studies are presented in Chapter 6.



# **1. Schizophrenia, schizotypy and the continuum hypothesis of psychosis**

## **1.1. Schizophrenia**

Schizophrenia is often described as a psychotic illness, which means a person may not be able to distinguish their own thoughts and ideas from reality. Broadly defined, psychosis is a concept relating to a set of symptoms which exist across a range of diagnostic categories including schizophrenia as well as bipolar disorder and schizoaffective disorder (Sims, 1988). Symptoms of schizophrenia vary between patients, creating diverse symptom profiles (Fujii & Ahmed, 2004; King, Laplante, & Joobar, 2005). The symptoms are usually divided into three groups: positive (e.g. hallucinations and delusions), negative (e.g. blunted affect, interpersonal difficulties), and disorganized (e.g. odd speech and behaviour).

Delusions and hallucinations are considered core ‘positive symptoms’ diagnosed with high reliability and often considered necessary for a reliable diagnosis of schizophrenia (Black & Boffeli, 1990; David & Appleby, 1992). Delusions are defined as “fixed beliefs that are not amenable to change in light of conflicting evidence” and may include a variety of themes such as persecutory, grandiose, somatic, referential and religious (American Psychiatric Association, APA, 2013). The distinction between a delusion and a strongly held idea depends in part on “the degree of conviction with which the belief is held despite clear or reasonable contradictory evidence regarding its veracity” (APA, 2013).



A hallucination is a perception (in any of the five senses) in the absence of external stimulus which has qualities of real perception. Both hallucinations and delusions are experienced as reactions to 'real' events, have immediate impact on behaviour, and are beyond voluntary control (Chapman & Chapman, 1988; Slade & Bentall, 1988).

The nature of schizophrenia has its roots in neurobiology where symptoms suggest underlying disease-compromised brain structures (Andreasen, 1990). Pioneers in the understanding of schizophrenia include Kraepelin (1877), whose observations led to a classification system with the following three manifestations: hebephrenia (aimless, disorganised, and incongruous behaviour), catatonia (lack of movement and stupor, agitated and incoherent behaviour), and paranoia (delusions of persecution and grandeur). For this, he coined the term 'dementia praecox', a single disease entity, and he remained pessimistic about recovery from this. His pessimism had a long-standing impact on psychiatry, with most health professionals resigned to the idea that those afflicted would have a poor prognosis with little or no hope for reaching their potential and having fulfilling lives. According to Killackey, Yung and McGorry (2007), this not only hampered neurobiological research, but caused widespread iatrogenic harm and inhibited early diagnosis because of an exaggerated fear of the expected outcome.

In contrast to Kraepelin, Bleuler (1911) believed in a less disease-based, more dimensional approach in which symptoms could span from mild personality dysfunction to full blown illness that he named 'schizophrenia'. Bleuler remained optimistic about treatment and recovery outcomes for those suffering on the more severe end of the continuum and concluded that the majority could maintain employment and/or retain some sense of self-sufficiency. He viewed the primary

symptoms of the illness as operating as a loss of association between thought processes, emotion and behaviour necessary for diagnosis; but he considered secondary symptoms such as hallucinations, delusions, catatonia and behavioural problems not to be caused by underlying neuropathology (Warner, 2009).

Although the majority of research over the last several decades has focused primarily on disease and illness factors, Bleuler's dimensional approach triggered an interest in a broader approach that went beyond disease to understand psychosocial variables, potentially associated with a transition to the more severe end of the continuum. Rather than seeing those with schizophrenia as having poor prognosis with deterioration in social and general functioning, his ideas led to a comprehensive approach. As a consequence this was reflected in research designs which viewed the trajectory as more flexible and adaptable than originally thought (Craig, Garety & Power, 2004; Jeppesen, Petersen, Thorup, Abel, Oehlenschlaeger, Christensen & Nordentoft 2005; Kuipers, Garety, Fowler, Freeman, Dunn, Bebbington, 2006).

Research developments have aimed to understand what may underlie the behavioural manifestations and have widened the concept of schizophrenia to include milder traits. It is now generally understood that schizophrenia is most likely not a single disorder (Johns & van Os, 2001; Munafò & Flint, 2009; Crow, 1980) and that to understand the aetiology requires a broader, multidimensional approach.

Bilder, Mukherjee, Rieder, and Pandurangi (1985) suggest that schizophrenia is not a monothetic construct, and many researchers have now replicated a three-syndrome model (Kulhara & Chandiramani, 1990; Liddle, 1987). One cluster of symptoms (alogia, attentional impairment, positive formal thought disorder, and bizarre behaviour) are believed to reflect primarily a disorganisation of thought independent

of current definitions of the positive/negative symptom construct. A second cluster of symptoms (affective flattening, avolition/apathy, and anhedonia) appear to reflect predominantly blunting of affect and volition. A third cluster (delusions and hallucinations) represent the florid psychotic features. There is now also an understanding that beliefs, feelings, and experiences associated with schizophrenia can occur, to varying degrees, on the same continuum as in the normal population (Claridge, 1997; Romme & Escher, 1989; Compton & Chien, 2008; Hanssen, Bak, Bijl Volbergh & van Os, 2005; Johns & van Os, 2001; Kaczorowski, Barrantes-Vidal & Kwapił, 2009; Myin-Germeys, Krabbendam, & van Os, 2003; Verdoux & van Os, 2002).

## **1.2. The continuum hypothesis of psychosis**

Traditionally, the most common way of conceptualising psychosis has been through a diagnostic approach that highlights the presence or absence of illness. Various tensions exist regarding the utility and theoretical underpinnings of this approach (Spitzer & Wakefield, 1999; Johns & van Os, 2001; Allardyce, McCreadie & van Os, 2007). The failure of basic scientific research to reveal a specific biological abnormality that distinguishes those who are categorised as having schizophrenia from those who are not indicates that categorical diagnostic systems such as DSM-IV and ICD-10 are possibly not that helpful for those who suffer with schizophrenia (van Os, 2003; Anckarsäter, 2010). For example, a large-scale study in nearly thirty countries involving face-to-face interviews with over 700 people diagnosed with schizophrenia found that 54% reported that the diagnosis had been a disadvantage (Thornicroft, Rose, Kassam & Sartorius, 2007). While some people find a diagnosis helpful, others find it limiting in how they can make sense of their experiences

(Jameson, 1996), and can be left feeling stigmatised. Another important point is that many of those diagnosed with schizophrenia often have negative life experiences such as sexual and physical abuse which is not given much relevance in the diagnostic entities (Dillon, 2006). Not considering an individual's subjectivity can be harmful because it can obscure and mystify the origins of problematic experiences and behaviour that has the potential to be understood (Romme & Escher, 1989).

Research findings over the past 100 years confirm the heterogeneity of clinical presentations regarding psychosis, which suggests that a single cause is unlikely to be found (Johns & van Os, 2001; Garety & Hemsley, 1994; Freeman, Garety, Kuipers, Fowler, & Bebbington, 2002; Garety & Freeman, 1999). If psychosis were the result of a specific gene, the distribution of psychosis in the population would be dichotomous; however, it is likely that more than one causal factor underlies psychosis, with the distribution of the trait dependent on the degree to which these factors interact (Johns & van Os, 2001). It is therefore likely that a multi-factorial framework is needed to understand the symptoms (Myin-Germeys et al, 2003; Freeman & Garety, 2003; Asai, Tomohisa, Yamauchi, Sugimori, Bando, & Tanno, 2010).

Symptoms of psychosis such as delusions and hallucinations may exist in milder, less clinical forms without meeting the threshold for psychosis. For example, approximately 1–3% of the general population experience clinically significant delusions, with a further 5–6%, experiencing less severe delusions (Freeman, 2006), especially suspicious thoughts, which have been reported to occur frequently in 10–15% of the general population (Freeman & Garety, 2006).

Young, Bentall, Slade and Dewey (1986) administered a modified version of the Launay-Slade Hallucination Scale (Launay & Slade, 1981) to 136 undergraduate students. They found a considerable proportion of subjects endorsed some of the most 'pathological' items, such as hearing a voice speaking their thoughts aloud. Posey and Losch (1983) found that 71% of college students reported some experience with brief, auditory hallucinations of the voice type in wakeful situations.

Hanssen et al. (2005) in a sample of 7,076 individuals found that only 1.5% had a DSM-III-R diagnosis of psychosis, yet 18.1% displayed other self-reported psychotic experiences. In the US National Comorbidity Survey of 5,877 individuals, approximately 28% endorsed psychosis-screening questions. However, when clinicians made diagnoses, the rate of psychosis was only 0.7% (Kendler, Gallagher, Abelson, & Kessler, 1996; Kessler, Birnbaum, Demler, Falloon, Gagnon, Guyer... & Wu, 2005).

These findings suggest that psychosis may exist within the general population from mild to more severe manifestations, but with the traditional definition of psychosis only capturing a small proportion of the population. With this being the case, schizophrenia and related disorders would be represented at only one end of this continuum (Claridge, 1997; Cadenhead, 2002; McGlashan & Johannessen, 1996; van Os, Hanssen, Bijl & Ravelli, 2000), which means we would not be getting a complete nor accurate representation of the schizophrenia continuum..

### **1.2.1. Importance of the continuum concept**

The concept of a psychosis continuum is important because it suggests that while some people who display psychosis-related traits or behaviours may become ill,

others will not, which means it is important that we understand the possible combinations of underlying causes that may contribute to a transition to the more severe end of the continuum, thereby helping to identify populations at risk (Claridge, 1997). In terms of the more severe end of the continuum, it may be that a full explanation of psychosis will need to link the phenomenological experiences with social, psychological, and neurobiological levels of explanation (Frith, 1992; Gray, Feldon, Rawlins, Hemsley, & Smith, 1991; David & Cutting, 1994).

Longitudinal studies show that subclinical psychotic experiences predict later onset of psychotic disorders (Chapman, Chapman, Kwapil, Eckblad, & Zinser, 1994) even when the psychotic experiences are not considered clinically relevant (Kelleher, Conner, Clarke, Devlin, Harley & Cannon, 2012). Poulton, Caspi, Moffitt, Cannon, Murray and Harrington (2000) showed that adolescents in a longitudinal birth cohort study who reported psychotic symptoms at age 11 were at a 5- to 16-fold increased risk for psychotic disorder at age 26; while more recently, van Os, Linscott, Myin-Germeys, Delespaul, and Krabbendam (2009) found a 16- to 60-fold increase in risk of transition to psychosis in individuals who reported having psychotic-like experiences in childhood and adolescence. This suggests that whatever is underlying the psychotic traits, they are stable over time and can interact with other potential risk factors.

The strength of the psychosis continuum concept is that it acknowledges the potential reciprocity between the proposed genetic predisposition to schizophrenia and the combined effects of certain life experiences, i.e. negative life events and trauma, in accounting for decompensation to clinical symptoms (Tienari, Wynne, Sorri, Lahti, Läksy, et al, 2004). The importance of understanding the potential

impact of life experience in non-clinical or psychosis-prone population is critical not only for the study of psychosis but also for the improvement of mental health in general. Rössler, Hengartner, Ajdacic-Gross, Haker, Gamma and Angst (2011) found that subclinical psychotic experiences have been demonstrated in longitudinal studies to predict later onset of affective symptoms. It can be difficult to know the direction of cause and effect between subclinical symptoms and other variables, which may overlap if not identified early. McGorry and Edwards (2002) showed that early interventions in prodromal schizophrenic patients reduces the risk of early transition to psychosis in young people and possibly reduces the incidence of schizophrenia. Therefore, early intervention is crucial for improving symptoms of psychosis as well as potential comorbid symptoms which may interact and have an impact on affective and cognitive functioning (Onwumere, Bebbington & Kuipers, 2011; Mokhtari & Rajarethinam, 2013).

### **1.3. Schizotypy**

Schizotypy, sometimes referred to as ‘psychosis proneness’, describes a broad range of symptoms and personality traits and is commonly understood as a predisposition to schizophrenia. The term ‘schizotypy’ is derived from ‘schizophrenic genotype’ (Claridge, 1997). However, there is disagreement as to what defines schizotypy. While some believe it to be more strongly indicative of a personality trait, others believe it to be more of a subclinical manifestation of psychosis which will have a bearing on how the construct will be measured.

Schizotypy is a multidimensional construct referring to a broad range of biologically determined personality factors, reflected in cognitive style and perceptual

interpretations that manifest subclinically in otherwise psychologically healthy individuals (Chapman, Chapman, & Kwapil, 1994; Claridge, 1997).

Schizotypy traits have been shown to map onto symptoms of schizophrenia. Positive and negative schizotypy (discussed below) are often associated with prodromal and schizophrenia spectrum symptoms (Barrantes-Vidal, Gross, Sheinbaum, Mitjavila, Ballespi & Kwapil, 2013).

### **1.3.1. Schizotypy symptoms and traits**

Conceptualisations in the literature of schizotypy and its symptoms and traits vary to some extent according to the philosophical underpinnings of the authors. At one extreme is a categorical, illness-based approach, for example as represented in DSM5 for the diagnosis for Schizotypal Personality Disorder (SPD) (APA, 2013). Individuals who meet the criteria for SPD and non-clinical populations who rate high in schizotypy often share abnormalities of psychopathology (Lenzeweger, Lane, Loranger & Kessler, 2007) and biology (Liouta, Smith, & Mohr, 2008). However, most individuals rating high on schizotypy do not tend to meet clinical criteria for an SPD diagnosis (Vollema, Sitskoorn, Appels, & Kahn, 2002). Given that the presence of psychotic-like symptoms during adolescence significantly increases the risk for later development of schizophrenia-spectrum disorders (Gooding, Tallent, & Matts, 2007), it is important to understand the potential risk factors that may interact with attenuated symptoms of psychosis. This may be best achieved by a dimensional approach, which is supported by epidemiological studies in the general population (Hanssen, Bijl, Vollebergh, van Os, 2003; Tien, and Eaton, 1992; Goulding, 2005; Johns & van Os, 2001; Joseph & Diduca, 2001).



There is now broad agreement over the main dimensions of schizotypy. Reviews of factor analytic studies suggest that, similar to schizophrenia, it has ‘positive’, ‘negative’ and ‘disorganised’ symptom dimensions (Claridge, McCreery, Mason, Bentall, Boyle, Slade & Popplewell, 1996; Venables, 1995; Vollema & van den Bosch, 1995; Kwapil, Barrantes-Vidal, & Silvia, 2008), with the positive and negative factors of schizotypy the most replicated dimensions (Cicero & Kerns, 2010; Kwapil et al., 2008; Vollema & van den Bosch, 1995).

‘Positive schizotypy’ is characterized by odd beliefs, unusual perceptual experiences and affective dysregulation. It relates to unusual perceptual experiences and magical thinking styles and beliefs, which may include extreme religious beliefs or conviction in ideas such as telepathy, extrasensory perception and clairvoyance (Chequers, Joseph, & Diduca, 1997; Barrantes-Vidal et al., 2013). These phenomena are not necessarily pathological as many individuals are not distressed by their experiences (Jackson, 1997). Subclinical hallucinatory experiences are commonly equated with the positive dimension of schizotypy (van & Merckelbach, 2003) and are viewed by many researchers to be cardinal personality traits indicative of positive schizotypal functioning.

‘Negative schizotypy’ is defined as avolition, asociality, diminished positive affect, and anergia (Vollema & van den Bosch, 1995). It is characterized by affective flattening, anhedonia, social disinterest, and cognitive impairment (Kwapil & Barrantes-Vidal, 2012).

‘Cognitive disorganisation’ refers to a tendency for thoughts and speech to become disorganised, which may reflect a similar pattern found in psychosis (Liddle, 1987).

Although such three-factor models of schizotypy are extensively used in research, other models with four or five factors have also been proposed (Mason, Claridge & Jackson, 1995; Chmielewski & Watson, 2008; Edmundson, Lynam, Miller, Gore & Widiger, 2011) that incorporate additional areas of assessment such as impulsivity, nonconformity, mistrust, and eccentricity or oddity. However, there appears to be agreement (Lin, Wigman, Nelson, Wood, Vollebergh, van Os & Yung, 2013; Wuthrich & Bates, 2006; Bora & Arabaci, 2009) that schizotypy reduces to the three core components of positive, negative and cognitive disorganisation, corresponding with the three-factor model of schizophrenic symptomatology (Bengal, Claridge, & Slade, 1989; Reynolds, Raine, Mellingen, Venables & Mednick, 2000).

### **1.3.2. Models of schizotypy**

There are three major theoretical models of schizotypy: the dimensional model (Eysenck, 1960), the quasi-dimensional model (Meehl, 1962) and the fully dimensional model (Claridge, 1997).

#### *1.3.2.1 The dimensional model (Eysenck, 1960)*

Eysenck (1960) conceptualised schizotypy as a single personality trait he named ‘psychoticism’, where psychosis represents the extreme upper end of this dimension. This model is based in personality theory and has the disadvantage of making little distinction between enduring personality traits and symptoms and signs of abnormality. Eysenck viewed psychoticism as a third personality dimension and a normal behavioural variation that existed on a severity spectrum with schizophrenia spectrum disorders and contributed to schizophrenia liability.

### 1.3.2.2 *The quasi-dimensional model (Meehl, 1962)*

This model places the schizotypy-schizophrenia continuum within the realm of illness. Rado (1953) believed schizotypy stemmed from personality traits that predispose an individual to anhedonia; managing this effectively could prevent breakdown to schizophrenia. Meehl (1962, 1990) elaborated on Rado's ideas, helping to broaden the concept of schizotypy while retaining the idea of schizotypy occurring through interaction between environment and a single gene. Meehl's model distinguishes between indicators of health and disorder, where 'schizotaxia' is a predisposition to schizotypy at the neurophysiological level while schizotypy is a predisposition to schizophrenia at the level of the organisation of the personality.

### 1.3.2.3 *Schizotypal Personality Disorder*

This approach helped shape the criteria for Schizotypal Personality Disorder (SPD) with a psychiatric perspective rather than a focus on personality and individual differences. This approach focuses on the pathological elements of schizotypy experienced by relatively few people. The criteria for SPD (e.g. social isolation, odd behaviour and thinking, and unusual perceptual experiences) can also be thought of as being phenomenologically similar to low-level psychotic symptoms.

Importantly, this perspective has an impact on research that holds the view that the nature of schizotypy is taxonic, i.e. categorical. However, according to Rawlings, Williams, Haslam and Claridge (2008), it is often the case that samples for taxonic studies are sometimes smaller than what is required for taxometric analysis, and drawn from restricted populations. This is in spite of claims by Beauchaine, Lenzenweger and Waller (2008) that the taxonic nature of schizotypy is consistently replicated.

#### 1.3.2.4      *The fully dimensional model (Claridge, 1995)*

Claridge's fully dimensional model is based in personality theory and proposes that some discontinuity of function, social or cognitive, must delimit the difference between psychological health and abnormality or disease (Claridge, 1997). He proposed that a dimension of schizotypy interacts with genetic and environmental factors to yield two possible outcomes. The first is a dimensional distribution of schizophrenia phenotypes within the schizophrenia spectrum which includes SPD (quasi-dimensional model). The second is similar to Eysenck's model and asserts that schizotypy contributes to an expressivity gradient of schizophrenia, ranging from variations in predisposing traits (subclinical psychosis) to clinical syndromes at the severe end of the spectrum (fully dimensional model). Claridge's dimensional model argues that dimensional phenotypes exist in tandem with taxonic phenotypes in the schizophrenia spectrum.

He proposes that the continuity of schizotypal phenomena is inherent in normal personality variation across a continuum, i.e. it can be associated with good psychological health or ill health (Claridge, 1997). Therefore, an individual's experience of paranormal phenomena, for example, can be understood without it necessarily being a personality disorder as specified by the DSM, or indicative of a predisposition for psychosis.

In summary, Eysenck's dimensional model focused on personality with little account of distinctions that may exist between symptoms and traits, while the psychiatric view of schizotypy is quasi-dimensional and focuses on variation within illness by describing signs and symptoms. In contrast, the fully dimensional model takes

normality as the starting point, encloses the quasi-dimensional model, and adds another form of continuity at the level of personality.

The present study follows the fully dimensional approach owing to its comprehensive nature and greater appreciation of normality on the spectrum. The fully dimensional approach is a better fit when working with an analogue population when making sense of signs and symptoms that one would expect to find in a university sample rather than a more clinical population.

#### **1.4. The epidemiology and aetiology of schizotypy**

How schizotypy is conceptualised has a bearing on views regarding its epidemiology and aetiology (Kwapil & Barrantes-Vidal, 2012). With a more categorical view proposed by Meehl (1962) and standardised by the DSM, it has been suggested that schizotypy is rare and is present in approximately 0.06–2.4% of the population (Torgersen, Kringlen & Cramer, 2001). However, Tien and Eaton (1992) proposed that schizotypy traits are not rare and found that 40% of individuals surveyed displayed schizotypal traits without meeting full diagnostic criteria for personality disorder as diagnosed by the DSM. A growing number of epidemiological studies provide support for the continuity of psychotic experience in the general population (Hanssen, Peeters, Krabbendam, Radstake, Verdoux & van Os, 2005; Johns & van Os, 2001; Verdoux & van Os, 2002; Linscott & van Os, 2013).

Female gender has been associated with a greater presentation of positive symptoms (Mancevski, Keilp, Kurzon, Berman, Ortakov, 2007; Maric, Krabbendam, Vollebergh, de Gaaf & van Os, 2003) and male gender with a greater number of negative symptoms (Køster, Lajer, Lindhardt & Rosenbaum, 2008; Moriarty, Lieber,

Bennett, White, Parrella, Harvey & Davis, 2001) and disorganised symptoms (Ring, Tantam, Montague, Newby, Black, & Morris, 1991).

The aetiology of schizotypy remains largely unknown, although the construct shares similar aetiological mechanisms to those found in psychosis (Barkus, Stirling, Hopkins, & Lewis, 2006). Processes thought to underlie hallucinations and delusions have been shown to be related to schizotypy in nonclinical samples (Allen, Freeman, McGuire, Garety, Kuipers, Fowler & Ray, 2005; Morrison, Wells, & Nothard, 2000). In spite of this, there are no definitive aetiological factors that can account for the full spectrum of psychotic beliefs and experiences that occur in both clinical and non-clinical populations.

### **1.5. Measures of schizotypy**

Many self-report scales have been developed for measuring schizotypal personality traits in non-clinical individuals. Well-validated examples include the Magical Ideation Scale (Eckblad & Chapman, 1983) and the Perceptual Aberration Scale (Chapman, Chapman, & Raulin, 1978). Scores on these have been shown to be able to predict the onset of psychotic disorders 10 years ahead (Chapman, Chapman, Kwapil, Eckblad, & Zinser, 1994; Chapman, Chapman & Kwapil, 1995).

The nature of the dimensions of schizotypy is dependent on sampling and methodology (Lin et al, 2013). A key concern is that questionnaire-based measures of schizotypy, when analysed using factor analysis, suggest that schizotypy is not a unified, homogeneous concept (McCreery & Claridge 2002), which can make it difficult to compare findings and their associations.

For example, when schizotypy is perceived as a sub-clinical entity along the continuum with the expression of the trait attenuated, this is then reflected in the instruments developed which try to capture the degree of ‘pathological’ experience similarly seen in psychosis (e.g. the Perceptual Aberration Scale, Chapman, Chapman & Raulin, 1978). When symptoms are viewed as ‘less pathological’ (the Schizotypal Personality Scale, Claridge & Broks, 1984) may be chosen instead.

### **1.5.1. O-LIFE**

More comprehensive inventories of schizotypal traits have been developed. The Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE; Mason et al., 1995) has four dimensions that tap four distinct aspects of schizotypy. These four scales measure the propensity for Unusual Experiences (e.g., visual or auditory hallucinations), Cognitive Disorganisation (e.g., anxiety, disordered thought, and general attentional difficulties), Introverted Anhedonia (e.g., the ability to experience pleasure through social activities) and Impulsive Nonconformity (e.g., reckless, disinhibited, rebellious aspects of schizotypy). The O-LIFE is an instrument based on analysis of what is probably the largest single dataset of schizotypal measures (Claridge et al., 1996) with high internal consistency (Mason et al., 1995), good test–retest reliability (Burch, Steel & Hemsley, 1998) and widespread use. It has been used across many research domains.

Broadly speaking, positive symptoms in schizophrenia have been aligned with the Unusual Experiences dimension of the O-LIFE schizotypy questionnaire and used with success to investigate schizotypy in relation to such topics as dissociative experience, childhood abuse (Startup, 1999) and paranormal beliefs and experiences as a function of mental health (Goulding, 2005).

### **1.5.2. Summary**

The importance of studying schizotypy lies in its potential relationship with schizophrenia and psychosis and the increased risk for individuals with high schizotypy that they may go on to develop these conditions.

Schizotypy factor dimensions correspond with symptom domains observed in patients with schizophrenia, suggesting that schizotypal traits and schizophrenic symptoms can be viewed on a continuum. Schizotypy, like schizophrenia, is hypothesised to be associated with emotional and behavioural dysfunction (Fonseca-Pedrero, Lemos-Giráldez, Paino & Muñiz 2011). Gender and age differences found in schizophrenia have also been found to be reflected in dimensions of schizotypy (Spauwen, Krabbendam, Lieb, Wittchen, & van Os, 2003; Venables & Bailes, 1994). Significant rates of schizotypy have been found in relatives of individuals with schizophrenia (Verdoux & van Os, 2002). Furthermore, the social and environmental risk factors associated with schizophrenia, such as urbanicity and childhood trauma, have also been shown to be associated with increased levels of schizotypy (Krabbendam, Myin-Germeys, & van Os, 2003).

Individuals high in schizotypy exhibit some of the psychological and biological abnormalities reported by individuals with schizophrenia yet generally lack a history of psychotropic medication, hospitalization, and other complications common in studies of schizophrenia (Dickey, Shenton, Hirayasu, Fischer, Voglmaier, Niznikiewicz & McCarley, 2000; Fernandes, Keller, Giese-Davis, Hicks, Klein, & Miller, 1999). That being said, the study of schizotypy has resulted in useful insights from a research perspective in further understanding what underpins schizophrenia (Raine, Lencz & Mednick, 1995). Also, by identifying risk factors underlying



schizotypy, the nature of this experience could potentially be better understood by those showing early signs of risk. In this way individuals can be helped to make sense of their experiences more broadly while offering them hope rather than fear.

Although not all individuals who are psychosis prone will become psychotic, some will, and others will have comorbid symptoms such as depression, substance use, and post-traumatic stress disorder (PTSD) which could complicate outcomes if not detected early (Amminger Henry, Harrigan, Harris, Alvarez-Jiminez, Herman & McGorry, 2011). When non-clinical symptoms progress to clinical symptoms, loss of insight is one of the last changes to occur in the phenomenological experience of acute psychosis (Birchwood, 1992). This could result in hospitalisation, further help-seeking behaviour and stigmatisation.

As well as potentially helping to improve the lives of individuals at risk, there are wider implications. Based on estimates between 2003 and 2004 for England, the total cost to society of schizophrenia was £6.7 billion, with the direct cost of treatment and care nearly £2 billion; the burden of indirect costs to the society was nearly £5 billion (Mangalore & Knapp, 2007). The investigation of potential risk factors underlying the schizophrenia spectrum is therefore important both for individuals and for society.

## **2. Cognitive and perceptual biases**

### **2.1. Introduction**

This chapter focuses on cognitive biases relevant to the schizophrenia spectrum and how emotion may play a role in an individual transitioning to the more severe end of the continuum. Although cognitive processes within the schizophrenia spectrum have been studied for a long time, their potential interaction with emotional processes has only gained momentum more recently (Barch, 2008).

Cognitive processes considered in this chapter include reasoning, perception, attention and interpretation. Cognitive biases in these modalities are common across clinical presentations including anxiety, depression and schizophrenia (Beck, Rector, Stollar and Grant, 2009) and in non-clinical populations that score high on schizotypy (Reed, Wakefield, Harris, Parry, Cella, & Tsakanikos, 2008; Gray, Fernandez, Williams, Ruddle, & Snowden, 2002; Woodward, Buchy, Moritz, & Liotti, 2007; Bhatt, Laws & McKenna, 2010; Juarez-Ramos, Rubio, Delpero, Mioni, Stablum, & Gomez-Milan, 2014, Tsakanikos & Reed, 2005a). There is also evidence that cognitive biases pose as risk factors for the transition from non-clinical psychotic experiences to clinically significant psychotic disorders (Beck et al, 2009).

In general, individuals have a tendency to favour information that confirms their preconceptions and maintains their beliefs about the world, but they can reconsider when there is evidence to the contrary (Johnson-Laird, 2006). However, in more clinical states, reconsideration of certain thoughts and perceptions may prove more difficult, even in the face of contradictory evidence. For example, in depression

individuals often believe that they are worthless despite the evidence of their achievements. In anxiety disorders, individuals may be convinced that people will not like them despite the many friends and family who continually seek them out. The persistence of inaccurate beliefs despite contradictory evidence which can reach an extreme in psychosis (Woodward, Butchy, Moritz & Liotti, 2007), where beliefs are often not only inaccurate but highly improbable, e.g. “the government is trying to poison me”. Cognitive distortions reflecting a bias towards threat can be found at the height of psychosis as well as in those high in schizotypy and/or delusion-proneness (Coy & Hutton, 2012; Mohanty, Heller, Koven, Fisher, Herrington & Miller, 2008). Cognitive biases about internal or external events can increase negative affective responses and negative behaviour, which can further confirm pathological beliefs making treatment more difficult even in the early stages (Garety, Kuipers, Fowler, Freeman & Bebbington, 2001). Cognitive biases relevant to positive symptoms on the schizophrenia spectrum are now considered.

## **2.2. Reasoning Bias**

Delusions (false beliefs) have become a focus of cognitive theories and empirical research and are considered to result from a number of interacting biological, psychological, social and cognitive factors (Garety, Bebbington, Fowler, Freeman & Kuipers, 2007; Kapur, 2003; van, 2006). One such factor is reasoning bias. Huq, Garety and Hemsley (1988) provided the first empirical evidence of a reasoning bias in individuals with delusions. In their study, the participants with psychosis were more likely than the others to reach a decision at an early stage in a simple task involving two colours of beads before receiving all the information needed for that decision. By not examining the available evidence sufficiently and instead

disproportionately favouring easy interpretations which fit with deluded thinking, these participants displayed a 'Jumping to Conclusions' (JTC) bias (Beck et al., 2009). Subsequent studies have demonstrated similar findings for people with delusions (Garety, Hemsley, & Wessely, 1991; Fine, Gardner, Craigie, & Gold, 2007; Peters & Garety, 2006) as well as in individuals who have recovered from delusions (Moritz & Woodward, 2005). It has therefore been hypothesised that the JTC bias may have a causal role in the formation of unusual beliefs and experiences (Lawrence & Peters, 2004).

There is evidence that individuals with delusions experience even more hasty decision making when exacerbated by stress (Ellet, Freeman & Garety, 2008) and when reasoning about emotional, as opposed to neutral, stimuli (Dudley, John, Young, & Over, 1997; Young & Bentall, 1997). For example, Warmen, Matin and Lysaker (2013) administered three reasoning trials to 57 participants, one trial with neutral material, and two trials with emotional material. They found the bias was increased with emotional rather than neutral material.

Beck and Rector (2005) have argued that some deluded thinking may develop as a compensation for an underlying sense of loneliness, unworthiness, or powerlessness for which there may have been negative life events. It may be that different life experiences can impact on cognitive mechanisms which influence the content of delusions at the severe end of the schizophrenia spectrum and the type of cognitive distortion at the less extreme end. Garety, Gittins, Jolley, Bebington, Dunne, Kuipers & Freeman (2013) found that negative emotion and negative self-concept played a more significant role in persecutory delusions than did reasoning bias, but they found

the reverse pattern in grandiose delusions suggesting different underlying emotional and cognitive interactions potentially impacting on the content and aetiology.

Although there has been less study of JTC bias in non-clinical populations, significant associations have been found in those who were delusion-prone (Colbert & Peters, 2002) and in those that were at high risk for psychosis (Broome, Johns, Valli, Woolley, Tabraham...McGuire 2007). Another study found that delusion proneness in a non-clinical sample was associated with greater self-certainty, i.e. overconfidence in one's own judgments (Warman & Martin, 2006), as measured by the Beck Cognitive Insight Scale (Beck & Warmen, 2004) and may be a stable characteristic of delusion-prone individuals rather than a temporary feature (Bora, Erkan, Kayahan & Veznedaroglu, 2007). This is important because those at risk for schizophrenia may have relatively stable cognitive distortions potentially exacerbated by overconfidence in their reasoning which could predispose them further to deluded thinking. If treatment starts at this stage before paranoid thoughts begin to crystallise, then the distress can be contained and the distortions integrated into more adaptive schemas.

Not surprisingly, the JTC bias has also been found to interact with emotion in non-clinical participants. Galbraith, Manktelow, Chen-Wilson, Harris and Nevill (2014) found that the JTC bias in 392 non-clinical participants aged 11 to 16 moderated the relation between anxiety and delusions. The delusion scores were higher in those adolescents who had both high anxiety and a JTC bias, which may suggest a role for emotion as a moderating variable at the non-clinical end of the schizophrenia spectrum. The literature with regards to schizotypy and reasoning bias is limited and therefore research investigating these factors is worthwhile.

### **2.3. Perceptual bias**

Biases in perception have been found in relation to those on the schizophrenia spectrum. Individuals with hallucinations tend to make premature and erroneous judgments in perceptual tasks when asked to guess the meaning of perceptually ambiguous words (Heilbrun & Blum, 1984) and demonstrate a bias towards believing that a certain type of stimulus is present when it is actually absent, although their perceptual accuracy remains intact (Bentall & Slade, 1985; Cahill et al., 1996; Boecker, Hijman, Khan & De Haan, 2000). Individuals with hallucinations also tend to misattribute internally generated events to an external source (Brebion, Smith, Amador, Malaspina & Gorman, 1998; Morrison & Haddock, 1997; Laroi & Woodward, 2007).

Related to this is source monitoring, which is where an individual identifies the original and distinctive characteristics of material they themselves generated (Johnson, Hashtroudi, & Lindsay, 1993). Its failure may be involved in the production of hallucinations. Poor source monitoring results in an inability to discriminate between real and imagined events (Bentall, 1990) and can operate as a bias predisposing an individual to attribute their thoughts or perceptions to an external source. For example, it has been shown that individuals with schizophrenia do not recognise recordings of their own voice when slight pitch modifications alter the recordings (Johns & McGuire, 1999). Studies have consistently demonstrated an attribution bias for internally generated events in schizophrenic patients with hallucinations (Morrison, 2001; Bentall, Baker, & Havers, 1991; Bentall & Slade, 1985; Blakemore, Smith, Steel, Johnstone, & Frith, 2000; Johns & McGuire, 1999). This has also been found in individuals high in positive schizotypy (Franck, Rouby,

Daprati, Dalery, Marie-Cardine & Georgieff, 2000; Asai & Tanno, 2008; Moore, Dickinson & Fletcher, 2011) and in adolescents who endorsed more hallucination items on the Schizotypal Personality Questionnaire and were deemed at high risk for developing psychosis (Larøi, Collignon, & Van , 2005; Debbane, Van, Gex-Fabry & Eliez 2009). Baker and Morrison (1998) suggested that pre-existing metacognitive beliefs may induce the individual to manage intrusive thoughts by attributing their content an external figure, thereby avoiding potential conflict and maintaining internal consistency. Neale (1988) suggests that deluded reasoning can result as an attempt to defend against negative emotional states such as low self-esteem and depression. Deluded reasoning can also operate as an attempt to avoid negative beliefs about the self by attributing them on to the actions of others in order to avoid a discrepancy between the ideal self and the actual self (Bentall, Corcoran, Howard, Blackwood & Kinderman, 2001; Raes & van Gucht, 2009). A self-serving attributional style may explain the formation of delusional belief where the continual preferential encoding and recall of delusion-sensitive material may over time reinforce and propagate the delusional belief (Kiran & Chaudhury, 2009). Over time if cognitive biases are left challenged, they can lead to deluded thinking and maladaptive ways of coping will continue.

Colbert, Peters and Garety (2010) used the term ‘Jumping to Perceptions’ (JTP) bias to describe the phenomenon of identifying an ambiguous perceptual event as external and real rather than internal and imaginary. JTP bias has been associated with hallucinations and has been replicated in undergraduate students who score highly on measures indicating a predisposition to hallucinations (Bentall & Slade, 1985; Rankin & O’Carroll, 1995; Vercammen, de Haan, & Aleman, 2008). For example, Tsakanikos and Reed (2005) found that positive schizotypy in non-clinical

participants was a predictor of false perceptual experiences during detection of fast-moving words (i.e. the participants guessed words that were not on the screen), although their accuracy remained intact. Participants higher on positive schizotypy guessed new words rather than words that were part of the trials which may have been due to translating an internally generated experience (i.e. verbal representations) into a perceptual experience (i.e. false perception of a word). However, the authors noted that it remained somewhat unclear whether the participants actually experienced false perceptual experiences. They reasoned that an alternative explanation may have been that such a bias might have reflected an increased willingness to give a response in a perceptually ambiguous situation and may have been more indicative of a JTC bias where less data are required before reaching a conclusion.

Colbert et al (2010) reasoned that there may be an association between delusions and impaired judgements about ambiguous sensory stimuli. They found a JTP bias in an auditory perceptual task in actively and remitted deluded participants suggesting that it may not be driven solely by the presence of hallucinations and that it may also be a trait characteristic in those with a propensity to delusional beliefs. Recently, Bristow, Tabraham, Smedley, Ward and Peters (2014) examined the specificity of JTC and JTP, as well as the relationship between them, using Huq et al.'s (1988) beads task and visual and auditory perceptual tasks. A sample of 98 individuals with delusions were divided into those who experience hallucinations (N = 51) and those who do not (N = 47). They found that both groups demonstrated a JTC bias, but the individuals with hallucinations showed a more pronounced JTP style in both modalities. They concluded that the JTC bias may show more specificity to delusions while the JTP bias may be more pronounced with hallucinations. A



frequent observation in both clinical samples is that delusions and hallucinations are often associated with each other (Johns & van Os., 2001) and therefore understanding the potential reasoning and perceptual biases which underlie them could provide further insight into their trajectory.

## **2.4. Attentional bias**

Attention is the mechanism for prioritising specific individual stimuli from all the competing information in the environment, and disturbances in attention are considered to be a key feature of schizophrenia.

What an individual attends to is often influenced by past experience. Associative learning theories assume the amount of attention to a cue depends on how well that cue predicted important events in the past (Kruschke, 2001).

Evidence of an attentional bias towards negative information has been found in psychosis, particularly with Stroop tasks. For example, the Stroop task was used with emotional stimuli to demonstrate that individuals with delusions have slower reaction times when naming the colour of affective words (Fear, Sharp, & Healy, 1996) and of paranoia-relevant words (Klumpp, Keller, Miller, Casas, Best & Deldin, 2010; Bentall, Kaney & Bowen-Jones, 1995). Individuals with psychosis are also slower to detect angry facial expressions than are healthy controls (Ohman, Lundqvist, & Esteves, 2001; Fox, Russo, Bowles & Dutton, 2001).

A similar delay in processing angry facial expressions has also been found in delusion-prone individuals (Green, Williams, & Davidson, 2001). The authors interpreted this as evidence of attentional bias for threat-related material, a bias that may be involved in the formation of delusional beliefs. Another study found that

attentional performance was poorer in those with positive schizotypy when the stimuli were both negative and affective (Mohanty et al., 2008). Perceptual aberration and magical ideation as measures of positive schizotypy have also been associated with increased behavioural interference on an emotional Stroop task (Mohanty et al, 2005). These findings suggest that emotion is important in selective attention to negative information even in non-clinical populations.

## **2.5. Interpretation bias**

Theories on the formation and maintenance of the positive symptoms of psychosis suggest that negative interpretations are critical to the distress associated with these symptoms. Negative interpretation bias is the tendency to interpret ambiguous information in a negative manner. At the height of psychosis where the content of a delusion, for example, may be “referential”, the individual may interpret any gestures or body language viewed on the television as being about them, with the underlying belief that the world is not what it seems, and become driven to make sense of what may unknowingly be a change in their internal processes. Delusions driven by underlying affect (mood congruent) may differ neurocognitively from those that have no such connection and can escalate into continuous biased recall of mood congruent memories and beliefs (Kiran & Chaudhury, 2009). Indeed, in individuals suffering with psychosis, interpretations that are congruent with their symptoms may result in reinforcement of their condition (Savulich, Shergill & Yiend, 2012). Affective processes play a role in how an individual perceives and interprets their experience. Many studies provide evidence that individuals with hallucinations tend to interpret the content of their voices as predominantly malevolent (Close & Garety, 1998; Romme & Escher, 1989; Honig, Romme, Ensink,

Escher, Pennings, & deBries, 1998; Thomas, Farhall & Shawyer, 2015). For some individuals it may be that the negative emotion is more associated with the traits underlying psychosis itself, while for others, negative affect may be more strongly related to interacting cognitive mechanisms for which negative life events may play an important part. The change when transitioning to the more severe end of the spectrum is often a slow but frightening experience where there is a breakdown in thought processes and often the line between external and internal reality become blurred.

It is possible that what may underlie the heterogeneity of the schizophrenia spectrum could also be operating at the neurotransmitter level. It is thought that dopamine could be intrinsically linked to the underlying predisposition. According to Kapur (2003), dopamine can mediate the salience of environmental events as well as internal representations for which the elements in one's mind become aberrant. Further, while hallucinations may reflect aberrant salience of internal representations, delusions may be an attempt to make sense of these experiences (Kapur, 2003). At the lower end of the continuum pre-psychotic individuals may develop an exaggerated release of dopamine where the sensory modalities are heightened and ideas and precepts which were once insignificant take on a huge surge of importance (Kapur, 2003). Dopamine dysregulation can provide a driving force for positive symptoms, but the individual's own cognitive, interpersonal and cultural context gives rise to this experience (Poulton et al., 2000). For example, beliefs the individual holds about their voices appear to be clinically important as mediators of associated distress (Thomas et al., 2015) and it is through this appraisal process that meaning becomes assigned to unusual experiences (Debbane et al., 2009).

## **2.6. Cognitive bias and emotion**

When cognitive biases interact with affect, they can lead to the formation and maintenance of anxiety and depressive disorders (Beck et al., 2009), as well as psychosis (Garety et al., 2001).

This is particularly the case where a cognitive bias prioritises the processing of material that specifically matches the pathology concerned (Savulich et al., 2013). Various types of stimuli can be emotionally negative. For example, a high degree of content specificity is displayed when an individual with PTSD shows a selective attentional bias for reminders of past trauma. This line of thinking may be important in understanding hallucinations, particularly their affective content (Gauntlett-Gilbert, Kuipers, 2003; Romme & Escher, 1989; Chadwick & Birchwood, 1994; Birchwood & Chadwick, 1997; Larøi and Woodward, 2007; Serper & Berenbaum, 2008) and emotional responses. In a general population study, Krabbendam, Myin-Germeys, Hanssen, de Graaf, Vollebergh, Back & van Os (2005) found that those who reported hallucinatory experiences and who went on to become depressed were at significantly higher risk of developing clinical psychosis. Anxiety and depression have also been found to be important in triggering hallucinations (Freeman & Garety, 2003). However, the mechanisms underlying these relationships are not well understood. One explanation relates to the individual's subjective experience. For example, negative emotions associated with inner, self-generated cognitive events may make those events more personally significant or more intrusive, triggering the individual to look for explanations of their anomalous experiences (Larøi & Woodward, 2007).

In Cognitive Therapy terms, subjective experience with regards to cognitive bias and affect is deemed important, especially when considering negative core beliefs. For example, negative core beliefs often develop in response to earlier negative experiences; they can be deeply ingrained and predispose a person to search for evidence confirming their negative core beliefs. For example, someone who suffers constant belittling by a parent may develop a core belief that they are unlovable or no good and so seek out relationships or experiences that confirm this belief. Cognitive distortions such as this can exacerbate already existing underlying psychopathology with regards to both psychosis and affect. Pre-existing negative schemas can influence appraisals of psychological and social adversity which can increase deluded thinking (Debbane et al., 2009).

## **2.7. The usefulness of studying cognitive bias in non-clinical populations**

Ongoing appraisals of experiences are important to the persistence of many positive symptoms for which cognitive biases can further distort appraisals of anomalous experiences. Cognitive biases can lead to negative beliefs about self and other people, which has been shown to be strongly associated with a predisposition to paranoia (Gracie, Freeman, Green, Garety, Kuipers, Hardy, ..., & Fowler, 2007) and may reflect social and emotional learning in the context of social adversity (Birchwood, 1989).

The transition into clinical symptoms often begins with a precipitating event i.e. environmental or neurobiological, which is often underpinned by dysfunctional thought patterns and cognitive biases. Therefore, identification of cognitive biases

more specific to the positive schizotypy domains might improve prognosis, through interventions such as Cognitive Behavioural Therapy (Beck et al, 2009). CBT targets cognitive biases in order to improve the affect associated with them. Specifically, it has been shown to reduce JTC bias through gathering evidence prior to arriving at conclusions, and it encourages integration of disconfirmatory evidence, graded reality testing and inference chaining (Kingdon & Turkington, 2006).

## **2.8. Conclusion**

Various forms of cognitive bias—often interacting with emotion—play an important role in the schizophrenia spectrum. Individuals suffering from psychosis are more likely to display cognitive bias; conversely, cognitive bias may reinforce and exacerbate psychotic symptoms, or may contribute to more serious clinical symptoms. Chadwick & Birchwood (1994) have argued that whether a voice is construed as malevolent or benevolent, is influenced by core cognitive schemata that are likely to be related to the individual's past and current life experiences and interpersonal relationships. Cognitive bias and the interaction with emotion are important aspects of the present study, which looks not only at false perceptions generated by participants, but also at the emotional context in which those false perceptions occurred and the emotional content of the false perceptions themselves. It has been demonstrated that the content of anomalous experience is often associated with an individual's personal history (Romme & Escher, 1989; Bentall, 1990; Chadwick & Birchwood, 1994) and the way that an individual feels about themselves (Close & Garety, 1998). The role of emotion, mood disorders and negative life events in the schizophrenia spectrum will be further explored in the following chapter.



### **3. The role of traumatic life events and mood disorders in schizophrenia and schizotypy**

#### **3.1. Introduction**

The previous chapter examined the relationship between the schizophrenia spectrum and cognitive bias, and how emotion interacts with this. The current chapter goes further and considers the relationship of early-age trauma, anxiety and depression with schizophrenia and schizotypy.

The development of psychosis involves many interacting and overlapping factors. Emotional disturbances can operate both as a trigger and as a vulnerability in contributing to psychotic symptoms in the schizophrenia spectrum (Myin-Germeys, Nicolson, & Delespaul, 2001; Kring, Siegal & Barrett, 2014; Myin-Germeys & van Os, 2008). Studies examining emotional disturbance have also considered the role of stress and its impact on brain function. According to the diathesis-stress model of schizophrenia, psychosis involves having a premorbid biological predisposition for mental illness (Kingdon & Turkington, 2006) for which stress may later trigger perceptual aberrations and emotional and/or cognitive processes (Garety & Freeman, 1999). As previously mentioned cognitive processes can facilitate appraisals of anomalous experiences as external or significant. Another pathway by which stress can impact on premorbid functioning and cognitive processes has been consistently shown in studies examining trauma and psychosis for which anxiety and depression have been found to be associated. These are considered to be risk factors contributing to the severity of psychotic symptoms.



Individuals with schizophrenia consistently demonstrate abnormalities in emotional perception, regulation and expression (Phillips & Seidman, 2008; Kerns & Berenbaum, 2010; Burbridge & Barch, 2002), as well as impairments in processing facial emotion (Edwards, Jackson, & Pattison, 2002). Schizotypy has also been shown to be associated with impairments in emotion (Debbane et al., 2009; Mohanty et al., 2008; Berenbaum, 1999; Berenbaum, Valera & Kerns, 2003; Startup, 1999; Green et al., 2001; Kerns & Berenbaum, 2000), providing further support of the hypothesis of continuity between emotion processing disturbances in schizophrenia and schizotypy.

This chapter discusses the inter-relationships between all these factors as well as the cognitive biases described in the previous chapter.

## **3.2. The effects of early-age trauma and life events on psychosis and schizotypy**

### **3.2.1. Schizophrenia and early-age trauma and life events**

Childhood abuse has been causally linked to numerous adult psychiatric disorders including depression, anxiety, substance misuse, post-traumatic stress disorder, personality disorders and dissociation (Chapman, Whitfield, Felitti, Dube, Edwards & Anda, 2004; Mullen, Martin, Anderson, Roman & Herbison, 1996). There is also indisputable evidence that early-age trauma and adverse life events are associated with psychosis and schizophrenia, with large population and longitudinal studies reporting significant effect sizes. In the British National Survey of Psychiatric Morbidity—a household survey of 8,580 adults—Bebbington, Bhugra, Brugha,

Singleton, Farrell, Jenkins and Meltzer (2004) found that people who experience psychosis are significantly more likely to report victimising experiences, often from childhood. Individuals who reported having experienced violence were twice as likely to be psychotic, while those who had been sexually abused before the age of 16 were nearly four times more likely to have psychosis. Individuals who met criteria for psychosis were 15 times more likely to have been sexually abused than those who did not have psychosis. When the interrelationship between psychosis and other negative life events and level of depression were controlled, the relative odds were reduced but still significant, with sexual abuse the most strongly associated. Another large survey of 17,337 people by Anda, Felitti, Bremner, Walker, Whitfield, Perry and Giles (2006) found that adverse childhood experience—including sexual abuse, physical abuse and emotional abuse—significantly increased the risk of hallucinations, after controlling for age, gender, race and education. A prospective study by Janssen, Krabbendam, Bak, Hanssen, Vollebergh, de Graaf, & van Os (2004) investigated self-reported childhood abuse in an adult general population sample of 4,045, with the rate of psychosis in the abused group 2.5 times that of those who had reported no abuse. And a significant review by Read, van Os and Morrison (2006) found a strong association between reports of childhood abuse and psychosis with a possible ‘dose-response’ relationship—the more severe the abuse, the higher the chance of psychosis. However, not everyone who suffers abuse goes on to develop psychosis or psychopathology.

Cognitive theories have proposed models for the relationship between trauma and psychosis. For example, responses to trauma may be mediated by mechanisms such as cognitive bias, dissociation, attributional style or interpretations of intrusions, which can be associated with both psychosis and post-traumatic stress disorder

(Morrison, 2001). It may be that a genetic predisposition underlying the schizophrenia spectrum influences the outcome more strongly towards psychosis rather than to PTSD. Central to Morrison's theory is that the experience of trauma can lead to negative beliefs such as "I am vulnerable", "others can't be trusted" and "the world is dangerous", which can heighten stress particularly in individuals with a predisposition to paranoia. Stress is probably the most constant factor in all associations underlying risk to the more severe end of the continuum where psychotic symptoms themselves appear to be elicited by extreme stress (Mueser, Butler, Sprock & Braff, 1996). It is likely that a neurobiological vulnerability factor such as a sensitivity to stress could also interact with environmental risks, such as trauma and negative life events (Myin-Germeys & van Os, 2008; Read, Perry, Moskowitz & Connolly, 2001), for which there may be a threshold at which underlying psychotic traits become pathological (Johns & van Os, 2001). That being said, the interplay of factors influencing the threshold to psychosis varies between individuals due to the subjective nature of stress and how this interacts with an individual's temperament and personality traits.

### **3.2.2. Schizotypy and early-age trauma and life events**

Childhood trauma appears to be associated with broader, non-clinical psychotic experiences (Spauwen et al., 2006; Janssen, Krabbendam, Bak, Hanssen, Vollebergh, de Graaf & van, 2004; Poulton et al., 2000; Johns & van Os, 2001; Startup, 1999). Attenuated symptoms of psychosis such as unusual perceptions and beliefs have been found in those with schizotypy with a history of childhood trauma and negative life events. For example, Ross and Joshi (1992) administered the Dissociative Disorders Interview Schedule (Ross, Heber, Norton, & Anderson, 1989)

to a random sample of 502 adults and found that paranormal/extrasensory experiences were common. A factor analysis of the paranormal experiences accounted for 44.0% of the combined variance of the scores. Further analysis revealed that paranormal experiences may represent an aspect of normal dissociation in which paranormal experiences can be triggered by trauma, especially childhood physical or sexual abuse.

Berenbaum (1999), in a sample of 458 college students, found that childhood maltreatment was associated with elevated levels of peculiarity as measured by the Perceptual Aberration and Magical Ideation scales (Chapman, Chapman, & Raulin, 1978; Eckblad & Chapman, 1983). The individuals who reported a history of childhood maltreatment were 10.5 times more likely than others to have high Perceptual Aberration scores. Berenbaum et al. (2003) later found in a community sample that both childhood maltreatment and a history of at least one traumatic incident were associated with elevated levels of schizotypy. In a longitudinal study involving 2,524 individuals aged 14 to 24, Spauwen et al. (2006) found an association between childhood trauma and clinical and non-clinical expressions of psychosis, particularly when the trauma had been associated with intense fear.

Stefanis, Delespaul, Lembesi, Avramopoulos, Evdokimidis, Stefanis and van Os (2004) suggest that elevated stress levels, though not necessarily traumatic, may bring an increased risk for clinical and non-clinical expressions of psychosis. Their study focused on the effects of urbanicity, and showed it to be a risk factor not mediated by neuropsychological impairment, traffic air pollution, obstetric complications or childhood socioeconomic position. This raises questions about the subjective role of stress and affect, and the extent cognitive disturbances such as

reasoning, attentional or interpretation biases operate as significant contributors in the transition to more clinical symptoms within the schizophrenia spectrum (Garety et al., 2001).

Studies have found that those scoring high in schizotypy have reported more frequent trauma-related intrusive memories after a stressful event than those with lower scores and that dissociation may play an immediate role between unusual experiences and trauma-related intrusion development (Holmes & Steel, 2004; Marzillier & Steel, 2007; Steel, Mahmood & Holmes, 2008). Dissociation may be construed as a defence against painful material for which attenuated symptoms of psychosis may serve to defend against intolerable affect and memories.

### **3.3. The effects of anxiety and depression on psychotic and schizotypy symptoms**

There is strong evidence of an association of anxiety and depression with psychosis or psychosis-like symptoms. Anxiety and depression are understood to pose as risk factors in the transition to more clinical symptoms, but also might result from the underlying psychosis.

Epidemiological community and general population studies report strong associations between the non-clinical expression of affective and psychotic symptoms (Armando, Nelson, Ross, Birchwood, Giradi & Fiori, 2010). Results from the British National Survey of Psychiatric Morbidity (N = 8,580) found that symptoms of anxiety and depression were associated with psychotic-like experiences (Johns, Cannon, Singleton, Murray, Farrell, Brugha & Meltzer, 2004) and a survey of psychotic symptoms in children and adolescents seeking treatment suggests that

patients reporting psychotic symptoms were more likely to experience co-morbid conditions of major depression, generalised anxiety disorder, and panic disorder (Ulloa, Birmaher, Axelson, Williamson, Brent, Ryan & Baugher, 2000). A recent study involving a representative community sample (N = 3,021) by Wigman, van Nierop, Vollebergh, Lieb, Beesdo-Baum, Wittchen & van Os (2012) found that 27% of those diagnosed with either anxiety or depression displayed symptoms of psychosis as opposed to 14% of those without a diagnosis of anxiety and depression. Anxiety and depression seem to be associated more strongly with positive schizotypy when there is a greater exposure to trauma and/or negative life events. Similar findings were also reported in a longitudinal study by Norman and Malla (1994).

Hanssen et al. (2003) reported that patients diagnosed with anxiety and mood disorders had elevated scores on positive psychosis items, suggesting that non-clinical psychosis includes variation in the affective domain. Anxiety and depression seem to play a prominent role in the transition to psychosis, but this role is not entirely clear. Numerous studies have reported emotional disturbance preceding and accompanying delusions and hallucinations (Freeman & Garety, 2003). The risk of developing a psychotic disorder was higher for individuals with combined expression of subclinical psychotic and affective experiences compared with those with only expression of psychotic experiences (Krabbendam et al., 2005).

Jones, Rodgers, Murray and Marmot (1994) examined data from a cohort of 5,000 people all born in the same week in 1946 who were followed from birth. Children who went on to develop psychotic symptoms were significantly more socially anxious at 13 years of age than those children who were not.

Higher levels of anxiety, self-focus and extreme responding have been found to be associated with hallucinatory predisposition (Allen, et al. 2005). Delespaul, de Vries & van Os (2002) found associations between anxiety levels and hallucinations and reported that subjective anxiety levels rose before the onset of hallucinations, and that this was the strongest predictor of hallucination intensity. Another study investigating auditory hallucinations in children for three years found that ratings of anxiety or depression accounted for the persistence of these hallucinations (Escher, Romme, Buiks, Delespaul, & van Os, 2002).

Garety et al. (2001) have suggested that the content of hallucinations can reflect emotion, arguing that emotion arising from both the trigger for hallucinations and the actual experience of the hallucinations can feed back into the content of voices. Repeated childhood trauma can cause structural and neurochemical abnormalities in the brain and nervous system (Bremner, 2007) and in situations where the trauma antedates the hallucinations, these abnormalities may play a role in triggering them (Whitfield et al., 2005).

Negative interpretations related to the content of hallucinations are in line with Slade's (1976) proposal that stressful events probably produce an elevation and disturbance of mood that may act as the symptom trigger in individuals predisposed to hallucinations. Not surprisingly, associations between themes expressed in positive symptoms and the characteristics of stressful events prior to the onset of hallucinations and delusions were found in the content of positive symptoms (Raune, Kuipers & Bebbington, 2006), suggesting continuity between negative life experience and the development of psychosis.

### **3.4. Interactions between trauma, anxiety, depression, stress, psychosis and cognitive bias**

This and the previous chapter have shown a complex web of interactions related to the schizophrenia spectrum. Early-age trauma, anxiety and depression are risk factors for developing psychosis and also influence the severity and nature of psychotic symptoms. Conversely, psychotic symptoms can cause stress and are associated with anxiety and depression. Cognitive biases, as described in the previous chapter, are associated with schizophrenia and schizotypy and are influenced by emotion. In turn, a cognitive bias such as interpretation bias may lead to thought processes that exacerbate anxiety or depression. For example, individuals with more depression and lower self-esteem have been found to experience hallucinations and delusions of greater severity with greater negative content, and are more distressed by them than individuals without depression or lower self-esteem (Smith, Fowler, Freeman, Bebbington, Bashforth...Kuipers, 2006).

These interactions may in part have a basis in neurobiology. The amygdala processes fear and anxiety resulting from trauma and stress (Vermetten & Bremner, 2002), which can have an impact on associative learning (Kim and Jung, 2006). Aversive environmental cues can become associated in the amygdala and influence maladaptive bias in attention and perception (Flor & Nees, 2014), which can contribute to an attentional bias confirming negative beliefs about self which can lead to further biases in the appraisal and interpretation of experiences. Consequently, gradual isolation and ongoing social anxiety initiated by the biased appraisal of the social environment can contribute to additional anxious/depressive affect. This in turn can breed increasingly delusional beliefs about the environment if



there is an existing predisposition for psychosis. MRI studies on patients with schizophrenia have revealed volume reductions of the amygdala and an attenuated response of the amygdala to emotional stimuli as compared to neutral stimuli (Aleman & Khan, 2005).

The Threat-Anticipation Model of persecutory delusions (Freeman, Garety, Kuipers, Fowler, & Bebbington, 2002) proposes that the interaction between emotional beliefs, anomalous experiences and cognitive biases leads to a search for meaning in which the explanation selected generates threat cognitions; this can become further exacerbated with anxiety or depression. How an individual learns to appraise environmental stimuli in childhood is also important as it can both sustain internal consistency in the face of conflict and act as a reinforcer of delusional beliefs (Garety et al., 2001). Individuals who have suffered from abuse often do not understand what they are feeling and are less likely to be aware of the emotional impact of events and subsequently are more likely to misinterpret them (Lincoln, Lange, Burau, Exner & Moritz, 2010).

### **3.5. Conclusion**

Early-age trauma, anxiety and depression play a significant role in the schizophrenia spectrum and therefore may have a bearing on the cognitive bias demonstrated by participants' false perceptions in the current study. This will be investigated as part of Study I, described in the next chapter.

The interplay of these factors also raises wider questions around treating those with depression and anxiety disorders, particularly where there may have been early-age trauma or there are indications of schizotypy suggesting a predisposition towards

psychosis. Acquiring a greater understanding of how emotional processing may play a part in a transition to the more severe end of the schizophrenia spectrum could potentially help to prevent a progression to more severe symptoms.



## **4. Study I: Schizotypy and false perceptions**

### **4.1. Overview of Study I**

This cross-sectional study used standard psychological questionnaires and a word recognition task to investigate whether positive schizotypy was a predictor of the number of false perceptions in a non-clinical sample. The study also looked at other factors that may be associated with the number of false perceptions reported, including early-life trauma, depression and anxiety.

The word recognition task involved a series of 127 trials each containing random sets of letters or target words from a list. Each target word belonged to one of four emotional conditions: neutral, positive, threat-related, or trauma-related. The dependent variables measured were the numbers of correct responses, incorrect responses and false perceptions.

Analysis showed a moderate correlation between positive schizotypy and false perceptions and a mild correlation between depression and false perceptions. However, multiple regression showed only positive schizotypy to be a predictor of false perceptions. There were also moderate correlations between positive schizotypy and early-life trauma and between positive schizotypy and depression. These results confirmed that, in a non-clinical sample, positive schizotypy scores indeed predicted false perceptions in the word recognition task, replicating past evidence (Bentall & Slade, 1985; Cahill et al., 1996; Rankin & O'Carroll, 1995; Tsakanikos, 2006; Tsakanikos & Reed, 2005a; Tsakanikos & Reed, 2005b).

## **4.2. Rationale and context for Study I**

The study of schizotypy is important because it allows for the study of unusual thoughts and behaviours that could potentially precede an episode of psychosis (Poreh et al., 1994). Schizotypy research has the advantage of avoiding possible confounding effects often found in a clinical population of medication, hospitalisation and disruptive symptoms such as low motivation, poor concentration, severe psychopathology, and comorbid alcohol and substance abuse (Tsakanikos, 2006). When non-clinical symptoms progress and there is a loss of insight, treatment becomes more complicated (Birchwood, 1992). This can be a terrifying experience for the patient and upsetting for friends and family. Therefore, research that can help to identify those at risk for psychotic symptoms before a loss of insight can occur could be important for preventative and early intervention. This study considers potential risk factors, particularly emotion. More research is beginning to examine the role of emotion in the transition to more clinical symptoms in the schizophrenia spectrum. Garety et al. (2013) suggest that different underlying emotional and cognitive interactions can impact on the content and aetiology of positive symptoms in psychosis. Therefore, the present study will examine potential cognitive factors as well as the potential impact of emotionality on the participants' responses in a word recognition task. The rationale for using the word recognition task is that previous studies using a similar paradigm demonstrated that positive schizotypy is associated with a tendency to report false perceptions. Although research has found important associations with cognitive dysfunctions associated with psychotic traits in non-clinical samples, considerably less research has looked at emotionality (Barch, 2008). This study goes further to investigate the role of trauma and emotion in the content of those false perceptions, and also the potential effect of the emotional condition of

target words on participants' responses. The rationale for this is that studies have found that emotion can have an impact on cognitive processes. For example, Larøi et al (2004) found that emotional salience and cognitive factors played a prominent role in the externalising bias in hallucination-prone subjects when the material presented was emotionally charged rather than neutral. They reasoned that this was due to an increased sensitivity for emotional arousal in positive schizotypy.

As previously discussed there is consistent evidence linking psychosis with early-age trauma. This includes many large-scale population-based studies which controlled for potential mediating variables, providing evidence of a dose-response association indicative of a causal relationship (Larkin & Read, 2012). Although there is evidence that positive schizotypy is associated with early-age trauma, this research is still in its infancy with many of the studies using small sample sizes (Holmes & Steel, 2004; Berenbaum et al., 2003).

Longitudinal studies have demonstrated that non-clinical psychotic experiences can predict later onset of psychotic disorders (Chapman et al., 2004; van Os, 2001). This suggests that those who score high in schizotypy measures and who also have suffered early-age trauma may be at a greater risk for later onset of psychotic symptoms. The present study examines data gained from standard psychological questionnaires which allows for the investigation of the potential relationship between positive schizotypy and early-age trauma and life events, depression, and anxiety. This study may be the first of its kind to consider the role of emotion in false perceptions in those high in positive schizotypy.

Understanding what may underlie sub-clinical psychosis for those who have experienced trauma could potentially enable a more accurate assessment and

formulation. This deeper understanding may help to prevent symptoms transitioning to the more clinical side of the continuum, which could become more complicated to treat.

### **4.3. Research questions**

The primary purpose of this study is to replicate previous findings that positive schizotypy is a predictor of false perceptions and then to extend this two new ways:

- a) to see whether the false perceptual experiences are predicted by other factors, and specifically early-age trauma.
- b) to see whether the emotional condition (positive, neutral, threat-related, trauma-related) of target words influences the participants' responses, particularly their false perceptions.

### **4.4. Methodology**

#### **4.4.1. Design**

The experimental design to investigate the effects of the emotional word condition on the participants' responses was 2 (recognition condition: word trial vs. non-word trial) x 4 (emotional condition: neutral, positive, threat-related, or trauma-related). As will be discussed in more detail below, a word trial was one where the stimulus included a target word from a list plus three non-words, while a non-word trial only included four non-words. The emotional condition was established in the word trials by the target word, and in non-word trials by the previous target word. The dependent variables recorded for each participant were the number of correct

responses, incorrect responses and false perceptions. To investigate possible differences in the means of these variables across the independent variables, 2 x 4 ANOVAs were carried out with post hoc testing.

The other research questions were addressed using correlations and multiple regression to investigate possible predictors of false perceptions and factors that might be associated with positive schizotypy.

#### **4.4.2. Participants**

One hundred and thirty one students (N = 86 female and N = 45 male) completed the questionnaires on-line. One student had to be excluded when it became apparent her vision without her spectacles was insufficient for the task. Nine participants declined to take part in the word recognition task. This left 121 complete sets of data (N = 79 female and N = 42 male). Their ages ranged from 18 to 40 (M = 23.1, SD = 5.3).

Apart from the requirement for participants to have normal or corrected-to-normal vision, there were no specific inclusion and exclusion criteria.

#### **4.4.3. Measures**

Participants completed four standard and widely used questionnaires which assessed positive schizotypy, trauma and life events, anxiety, and depression. These were administered on-line with standard instructions.

##### *4.4.3.1 Positive schizotypy (unusual experiences)*

The Oxford–Liverpool Inventory for Feelings and Experiences (O-LIFE; Mason, Claridge & Jackson, 1995) consists of 159 items selected based on factor-analytic



studies. The first three scales correspond to a three-factor model of schizophrenia (Liddle, 1987): positive (unusual experiences), negative (introverted anhedonia), and disorganized (cognitive disorganization).

The positive schizotypy scale (unusual experiences) was used in this study. This has 30 questions that mainly assess unusual perceptual experiences and beliefs, reflecting the positive symptoms of psychosis (e.g., “When in the dark do you often see shapes and forms even though there is nothing there?”; “Have you ever felt that you have special, almost magical powers?”).

This scale was chosen as previous studies (Tsakanikos & Reed, 2005; Garety, 2001) have demonstrated that this is the subscale that shows the greatest correlation with anomalous perceptual experience, such as the false perceptions in this study.

#### *4.4.3.2 Anxiety*

The Spielberger Trait Anxiety Inventory (STAI-T; Spielberger, 1983) rates the affective, cognitive, and physiological manifestations of anxiety. Form Y has 20 items for assessing trait anxiety and 20 for state anxiety. State anxiety items include: “I am tense”, “I am worried” and “I feel calm”. Trait anxiety items include: “I worry too much over something that really doesn’t matter” and “I am a steady person”. All items are rated on a 4-point scale (“Almost Never” to “Almost Always”). Scores can range from 20 to 80. Higher scores indicate greater anxiety.

Internal consistency coefficients for the scale have ranged from .86 to .95; test-retest reliability coefficients have ranged from .65 to .75 over a 2-month interval (Spielberger et al., 1983).

#### 4.4.3.3 *Depression*

Beck's Depression Inventory (BDI; Beck et al, 1961) assesses the clinical symptoms of depression, and is one of the most widely used self-rating scales. The BDI is a 21-item questionnaire that asks about the participant's feelings over the past week, with each question scored from 0 to 3. The overall score is a simple sum of the answers and can range between 0 and 63, where 0–9 indicates non-depressed, 10–15 meeting no diagnostic criteria (dysphoric), 16–23 meeting diagnostic criteria (mild, moderate depression), and 24 or above severe depression (Kendall et al, 1987).

#### 4.4.3.4 *Early trauma and life events*

The Early Trauma Inventory–Short Form (ETI-SF; Bremner, Bolus & Mayer 2007) retrospectively assesses various childhood traumas that occurred before the age of 18. Trauma inventory items include 11 questions assessing negative life events, such as “Were you ever exposed to a life threatening disaster?” Five questions assess physical punishment (e.g., “Were you ever slapped in the face with an open hand?”); five questions assess emotional abuse (e.g., “Were you often ignored or made to feel like you don't count?”); and six questions assess sexual abuse (e.g., “Were you ever forced or coerced to perform oral sex on someone against your will?”). The last two questions in the inventory assess the impact of the above traumas: “Did you experience emotions such as intense fear, horror or helplessness?” and “Did you feel out-of-your-body or as if you were in a dream?”

All items are rated on a scale (1 for yes and 0 for no). The score can range from 0 to 27. Higher scores indicate greater trauma. All domains showed high internal consistency (Cronbach coefficient  $\alpha > 0.7$ -.87) (Bremner, Bolus & Mayer, 2011).

#### 4.4.4. Word recognition trial

The task comprised 127 trials: 64 word trials and 63 non-word trials. For each trial, four identical stationary circles were displayed briefly on a computer screen, one in each quadrant. In a word trial, one of the circles contained a target word three to seven letters long. The other three circles contained meaningless, mostly unpronounceable collections of letters, again three to seven letters long (see Figure 4.1). In the non-word trials, all four circles contained such non-words. Each trial was displayed onscreen for 500 milliseconds, preceded by a fixation circle displayed for 5,000 milliseconds (see Figure 4.2).

Figure 4.1

*An example of a screen shot of a trauma-related word trial where the target word was “dirty”.*

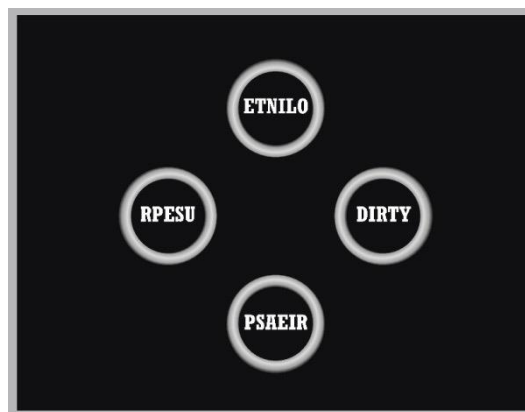
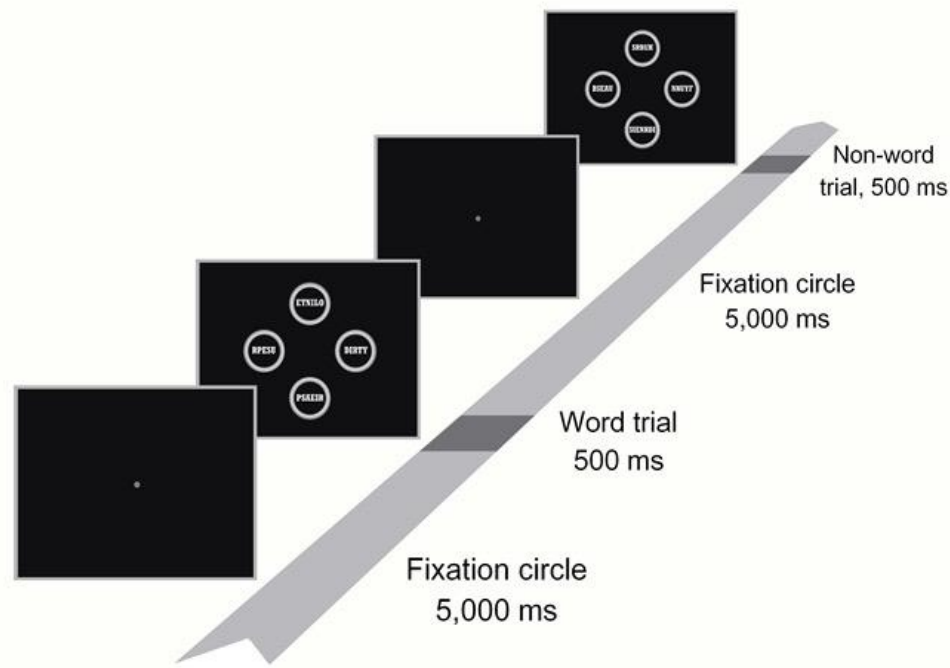


Figure 4.2

*A sequence of screenshots from a word recognition task, showing the fixation circle followed first by a word trial and then a non-word trial*



A total of 32 standardised target words were used, taken from a study by Blix and Blennen (2011). The reason for using a standardised word list was to avoid results being affected by variance in emotional intensity, valence, or categorisation associated with the individual words, making results across studies difficult to compare (Strauss & Allen, 2008).

Each word belonged to one of four emotional conditions—positive, neutral, trauma-related or threat-related—used in the previous study. Eight target words were used for each emotional condition. For example, JOY and PRAISE were in the positive word list; SHOP and BRUSH in the neutral word list; ABUSE and ATTACK in the trauma-related word list and MUGGED and HIJACK in the threat-related word list. (See Appendix IV for the full list of words.)

The software was tested with four non-participants to evaluate the effectiveness of the experimental parameters—particularly the stimulus display time and trial interval.

#### **4.4.5. Procedure**

The questionnaires were administered using Qualtrics online survey software (Version 9 of the Qualtrics Research Suite, copyright 2014), a system widely used to create and distribute survey instruments. All participants completed the questionnaire before undergoing the experiment.

Participants from Roehampton University signed up on SONA to attend the Department of Psychology lab to complete the experiment. Participants from the University of South Wales completed the experiment in a private room in the library, and those from Llanishen High School completed the experiment in a private office designated by the Head Teacher.

The participants were asked to register their consent and confirm their age via the initial on-screen form (See Appendix I), and this was followed by the questions for the Beck's Depression Inventory, Early Trauma Questionnaire, Unusual Experiences and State and Trait Anxiety Inventory. The results were exported from Qualtrics directly to SPSS Version 21 (IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp) and were linked with data generated from the word recognition task including the false perceptions, number of correct responses and number incorrect.

Before starting the word recognition task, participants were given standard written instructions (see Appendix II) and four practice trials. If participants saw a word on

screen during a trial, they were instructed to say that word out loud; this was noted down by the experimenter. If they did not see a word they were instructed to say “not sure”. The participant was not made aware of the emotional condition of the words or the purpose of the experiment, and at the time of testing, the experimenter was unaware of the participants’ schizotypy status. Once the task began, it was taken through to completion without a break, lasting around 12 minutes.

The computer software randomised whether a trial was a word trial or a non-word trial, which target word was used, and in which circle it was displayed. This randomisation helped to avoid possible systematic effects (fatigue, fluctuation of vigilance/motivation/energy level, habituation, and practice effects).

A total of 32 target words were used, each displayed twice during the task. Eight target words were used for each emotional condition. All the target words of a given emotional condition were presented together in a block, interspersed randomly with non-word trials. The order of these blocks was counterbalanced across participants to avoid order effects.

When the experiment ended, the participants were given a debrief sheet that explained the study (see Appendix III).

#### **4.4.6. Ethical Considerations**

All participants were treated ethically in accordance with the British Psychological Society code (BPS, Code of Human Research Ethics).

#### *4.4.6.1 Respect for the autonomy and dignity.*

Participants were informed about the nature of the study before deciding whether to participate or not. It was ensured that the participants had an opportunity to ask questions and were provided with a participant information sheet with University contact details including the contact number for the Director of Studies and Head of Department. The Consent Form is included in Appendix I.

Participants were informed that they had the right to withdraw from the study at any time, and they could ask for their data to be withdrawn up until one month after they participate.

The privacy of the participants was respected by making sure that their data was not identifiable. Confidentiality was ensured by anonymising the collected data in such a way that it could not be traced by other parties.

#### *4.4.6.2 Scientific value*

The scientific value of this research project was ensured by working closely with a supervisory team, and seeking advice and feedback from other professionals as needed.

#### *4.4.6.3 Social responsibility*

The knowledge generated will be used for beneficial purposes, potentially improving understanding of schizotypy and the schizophrenia continuum. Therefore, it was ensured that the data was analysed and reported as objectively as possible, aided by regular supervision and workshops.

#### *4.4.6.4 Maximising benefit and minimising harm*

This study aimed to increase understanding of schizotypy. All questionnaires were administered on-line. Participants were informed of support services in case they experienced any distress while filling out the questionnaires.

It could be argued that there was an element of deception involved in this study in that the questionnaire completed by the participants referred only to unusual experiences rather than referring to schizotypy itself. However, schizotypy is technically defined in terms of reports of Unusual Experiences (UE), one of its standard subscales, and by using this more descriptive term (rather than the more theoretical term ‘schizotypy’) we avoided potentially causing some alarm to participants.

Electrical equipment and fire safety were considered in line with the University’s safety policies

#### **4.4.7. Analysis**

The analysis used repeated measures ANOVAs (or Friedman tests for the non-parametric data) and post-hoc t-tests where applicable to investigate possible differences in the means of the dependent variables across the 2 x 4 independent variables. Correlation analysis and multiple regression were used to investigate factors that might be associated with the number of false perceptions and with the positive schizotypy scores.



## 4.5. Results

### 4.5.1. Descriptive data

#### 4.5.1.1 Questionnaire data

Table 4.1 presents descriptive statistics for the questionnaire data.

Table 4.1

*Summary of questionnaire results providing mean, standard deviation (SD), minimum and maximum.*

Questionnaire	Mean	SD	Minimum	Maximum
O-LIFE Unusual experience total (Positive schizotypy)	6.78	6.00	0	23
Early Trauma Inventory-SF total	5.65	4.83	0	23
...Life events total	1.91	1.75	0	9
...Sexual abuse total	.56	1.12	0	5
Beck Depression Inventory Total	10.50	8.82	0	39
Spielberger State-Trait Anxiety Inventory total	90.42	8.17	62	108
...State total	44.26	5.69	26	54
...Trait total	46.16	4.67	35	60

The Unusual Experiences (positive schizotypy) data were comparable with the mean (9.7, SD = 6.7) found for the general population by Mason et al. (1995).

Visual inspection of histograms of the data suggested that the distributions of the anxiety scores were approximately normal, with the characteristic bell-shaped symmetry, whereas the depression and trauma scores were somewhat positively

skewed, i.e. with extended tails to the right. The distribution of the positive schizotypy scores was more complex, with two apparent peaks and a tail to the right. These results suggest that only the anxiety data were suited for parametric correlation analysis (see section 4.5.3).

#### 4.5.1.2 *Word recognition data*

A correct response was when a participant correctly identified the target word. The maximum number of correct responses that could be obtained in the word trials was 64. Nearly half of the participants (N = 55) scored between 23 and 29.

Incorrect responses were words that were among those in the word trial list but guessed incorrectly. Nearly 70% of the participants (N = 81) had 0, 1 or 2 incorrect responses. The maximum number was 15.

False perceptions were words that participants reported they saw but that were not displayed on the computer screen during that trial. During word trials these were words that were not among those on the original word trial list, or a word from the target word list reported during a non-word trial. Nearly 80% of the participants (N = 96) reported zero, one or two false perceptions. The maximum number was 25.

(See Appendix V for a list of the false perceptions.)

Table 4.2 summarises these results.

Table 4.2

*Summary of word recognition task results for the mean, standard deviation (SD), minimum and maximum numbers of correct responses, incorrect responses and false perceptions.*

	Mean	SD	Minimum	Maximum
Number correct	24.76	7.186	8	44
Number incorrect	2.32	2.709	0	15
Number of false perceptions	1.70	3.060	0	25

Visual inspection of histograms of these data showed that the numbers of correct responses were distributed normally. However, the numbers of incorrect responses and of false perceptions followed highly skewed distributions, with a predominance of zero scores, indicating that these data needed the use of non-parametric methods for analysis.

#### **4.5.2. Experimental data**

##### *4.5.2.1 Mean correct responses across the four conditions*

In the 64 word trials, eight words were presented twice from each neutral, positive, threat-related and trauma-related condition.

Table 4.3

*Mean and standard deviation (SD) correct responses across the four emotional conditions*

Emotional condition	Mean	SD
Neutral	7.45	2.969
Positive	6.69	2.402
Threat-related	5.54	2.513
Trauma-related	5.09	2.446

Inspection of Table 4.3 shows that participants made more correct responses in the neutral condition than in any other condition. To investigate whether the differences between the four emotional conditions (neutral, positive, threat-related, trauma-related) were statistically significant a repeated-measures ANOVA was carried out on correct responses. This statistical analysis revealed a significant difference ( $F = 29.943$ ,  $df = 3$ ,  $p < .001$ ).

To determine the means responsible for the significant effect a series of t tests (i.e. pairwise comparisons) were carried out for all permutations of emotional condition.

To correct for Type I error, the Bonferroni correction was set at the new adjusted p value of .0083. Post hoc comparisons revealed significant differences between:

neutral and threat-related ( $t = 6.405$ ,  $p = .001$ ), with more correctly named target words observed for neutral trials ( $M = 7.45$ ) compared to threat-related trials ( $M = 5.54$ );

neutral and trauma-related ( $t = 8.080, p = .001$ ), with more correctly named target words observed for neutral trials ( $M = 7.45$ ) compared to trauma-related trials ( $M = 5.09$ );

positive and threat-related ( $t = 4.290, p = .001$ ), with more correctly named target words observed for positive trials ( $M = 6.69$ ) compared to threat-related trials ( $M = 5.54$ );

positive and trauma-related ( $t = 5.851, p = .001$ ), with more correctly named target words observed for positive trials ( $M = 6.69$ ) compared to trauma-related trials ( $M = 5.09$ ).

#### 4.5.2.2 *Mean incorrect responses across four conditions for word trials*

Table 4.4

*Mean and standard deviation (SD) incorrect responses across the four emotional conditions in the word trials.*

Emotional condition	Mean	SD
Neutral	.38	.624
Positive	.54	.809
Threat-related	.57	.786
Trauma-related	.53	.978

Inspection of Table 4.4 shows that participants made more incorrect responses in the word trials for positive, threat-related and trauma-related emotional conditions than in the neutral condition. To investigate whether the numerical differences between the four emotional conditions were statistically significant, a Friedman test for non-

parametric data was carried out on incorrect responses (word trials). The analysis revealed no statistically significant difference ( $\chi^2 = 6.261$ ,  $df = 3$ ,  $p = .100$ ).

#### 4.5.2.3 *Mean incorrect responses across four conditions for non-word trials*

Table 4.5

*Mean and standard deviation (SD) incorrect responses across the four emotional conditions in the non-word trials.*

Emotional condition	Mean	SD
Neutral	.06	.234
Positive	.10	.327
Threat-related	.07	.293
Trauma-related	.05	.218

Participants made more incorrect responses in the positive conditions than in the other non-word conditions. To investigate whether the differences between the four emotional conditions were statistically significant, a Friedman test for non-parametric data was carried out on incorrect responses (non-word trials). The analysis revealed that no statistically significant difference ( $\chi^2 = 2.126$ ,  $df = 3$ ,  $p = .547$ ).

#### 4.5.2.4 Mean false perceptions across four conditions for word trials

Table 4.6

*Mean and standard deviation (SD) false perceptions across the four emotional conditions for the word trials*

Emotional condition	Mean	SD
Neutral	.35	.727
Positive	.23	.574
Threat-related	.21	.515
Trauma-related	.22	.626

Participants had more false perceptions in the neutral condition than in any other condition. To investigate whether the differences between the four emotional conditions were statistically significant, a Friedman test for non-parametric data was carried out on false perceptions (word trials). The analysis revealed no statistically significant difference ( $\chi^2 = 6.037$ ,  $df = 3$ ,  $p = .110$ ).

#### 4.5.2.5 Mean false perceptions across four conditions for non-word trials

Table 4.7

*Mean and standard deviation (SD) false perceptions across the four emotional conditions for non-word trials.*

Emotional condition	Mean	SD
Neutral	.11	.361
Positive	.19	.537

Threat-related	.23	.544
Trauma-related	.17	.472

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Participants had more false perceptions in the threat-related condition than in any other condition. To investigate whether the differences between the four emotional conditions were statistically significant, a Friedman test for non-parametric data was carried out on false perceptions (non-word trials). The analysis revealed a statistically significant difference ( $\chi^2 = 8.057$ ,  $df = 3$ ,  $p = .045$ ). However, examination of the data suggested that it is likely that this result is spurious. The mean ranks in the Friedman analysis for the neutral, positive, threat-related and trauma-related conditions were 2.38, 2.53, 2.61 and 2.48, respectively, suggesting that the main difference was a lower number of false perceptions in the neutral condition in the non-word trials. However, the mean ranks for numbers of false perceptions in the *word* trials showed a *greater* number of false perceptions in the neutral condition (the mean ranks were 2.64, 2.48, 2.43 and 2.45, respectively). This suggests that the neutral condition was not the cause of the lower numbers of false perceptions in the non-word trials. The statistical significance of the result, which was only slightly lower than the significance level of  $p = .05$ , may have been due to the low number of false perceptions; in this instance this meant a particularly high number of zero scores and thus a somewhat different shape of distribution of the data than for the other conditions, with the difference being pronounced due to the low numbers involved. The Friedman test assumes similar distributions for the data compared, and is more likely to produce false positive results if this assumption is not met.



### 4.5.3. Associations between experimental and self-report data

The main focus of two of the research questions was whether there were associations between positive schizotypy (Unusual Experiences) and false perceptions, and between early-age trauma and positive schizotypy. Other possible correlations with false perceptions or positive schizotypy were also investigated, as summarized in Table 4.8. As described in section 4.5.1, only the anxiety data and numbers of correct responses were normally distributed, so non-parametric Spearman correlation coefficients were calculated for all the correlations except for that between anxiety and the number correct, where Pearson correlation analysis was used.

Table 4.8

*Correlation matrix for the main variables (N = 121)*

	Schizotypy	Trauma	Depression	Anxiety	Number correct	Number incorrect
Trauma	<b>.390**</b>					
Depression	<b>.561**</b>	<b>.324**</b>				
Anxiety	.099	<b>-.183*</b>	-.133			
Number correct	-.121	-.069	-.010	(P) -.129		
Number incorrect	<b>.194*</b>	-.044	.165	-.126	-.094	
False perceptions	<b>.390**</b>	<b>.241**</b>	<b>.286**</b>	.041	<b>-.296**</b>	<b>.375**</b>

\* Significant at  $p < .05$  (2-tailed); \*\* significant at  $p < .01$  (2-tailed)

(P) Pearson correlation coefficient. All the rest are Spearman coefficients.

The results showed a correlation (.390,  $p < .01$ ) between positive schizotypy and false perceptions; both the magnitude and the direction of this association were comparable with the findings found in similar studies by Tsakanikos and Reed

(2005a; 2005b) and Reed et al. (2008). A negative correlation ( $-.296, p < .01$ ) between false perceptions and the number correct suggested that people with a higher number of false perceptions were more likely to have fewer correct responses, which is in line with those previous studies. The correlation between positive schizotypy (Unusual Experiences) and early-age trauma ( $.390, p < .01$ ), suggests that people who suffered more trauma before the age of 18 were more likely to have higher schizotypy scores. These results are comparable with the correlations found in similar studies by Steel, Mahmood and Holmes (2008) and Holmes and Steel (2004). The correlation between positive schizotypy and depression ( $.561, p < .01$ ), supports previous findings of an association between schizotypy and depression (e.g. Wigman et al., 2012).

#### **4.5.4. Multiple regression**

##### *4.5.4.1 Dependent variable: False perceptions*

Multiple regression analyses (method: Enter) were carried out to examine whether schizotypy scores could predict false perceptions. For this analysis, positive schizotypy, depression and early-life trauma were the predictor variables, and the false perceptions were the dependent variable. The overall equation was statistically significant ( $F = 5.43, p < .01$ ) accounting for 10.0% (adjusted  $R^2$ ) of the variance. However, positive schizotypy (Unusual Experiences) was the only significant predictor ( $\beta = .16, t = 3.13, p < .01$ ; the significance levels for depression and trauma were considerably higher at  $p = .38$  and  $p = .40$ , respectively). Multicollinearity analysis showed variance inflation factor (VIF) values of 1.42, 1.41 and 1.25 for positive schizotypy, depression and trauma, respectively; these are all well below 5,

the accepted level for possible concern about collinearity, and indicate that collinearity was not an issue. Taken together, these results suggest that positive schizotypy is a significant independent predictor of the number of false perceptions.

These results were similar to those of Tsakanikos and Reed (2005a; 2005b; Barkus et al., 2011; Tsakanikos, 2006) in similar studies using word recognition tasks.

#### *4.5.4.2 Dependent variable: Positive Schizotypy (Unusual Experiences)*

In the second regression analysis, with positive schizotypy was the dependent variable, the early-age trauma scales (sexual abuse, life events, intensity and emotional abuse) were entered as the predictor variables. The regression equation was statistically significant ( $F = 10.8, p < .001$ ) accounting for about 13.3% of the variance (adjusted  $R^2$ ). Sexual abuse ( $\beta = .25, t = 2.68, p < .01$ ) and life events ( $\beta = .19, t = 2.02, p < .05$ ) were the significant predictors.

## **4.6. Discussion**

### **4.6.1. False perceptions**

#### *4.6.1.1 Positive schizotypy and false perceptions*

The results confirmed that positive schizotypy independently predicts the number of false perceptions, i.e. that participants who scored higher in positive schizotypy tended to experience more false perceptions.

This has been found in other studies. For example, Tsakanikos (2006) found a bias in undergraduate students who reported a higher number of false perceptions when

perceptual load was greater during a word recognition task. This was also found in a variant of the present paradigm that involved fast-moving words (Tsakanikos & Reed, 2005). Barkus, Smallman, Royle, Barkus, Lewis & Rushe (2011) found in a non-clinical population under 19 years of age that schizotypy scores predicted false perceptions in a signal detection task designed to detect propensity towards false perceptions under ambiguous auditory conditions.

These results are not surprising. Positive symptoms of schizophrenia, such as hallucinations, unusual perceptual experiences, and delusional ideas, have been associated with a bias towards believing that experimentally created events are present in the absence of such events (Bentall & Slade, 1985; Boecker, Hijman, Kahn, & De Haam, 2000; Cahill et al, 1996). Similar phenomena are experienced by those on the lower end of the schizophrenia continuum, such as those with positive schizotypy. Indeed, the measure for positive schizotypy administered to participants in the current study included delusion-proneness and perceptual aberrations.

Delusion-proneness has been found to be more typically associated with jumping to conclusion (JTC) bias and perceptual aberrations with a jumping to perception (JTP) bias. However, it is uncertain whether the participants in the current study experienced false perceptions, reflecting an actual perceptual bias, or whether there was an increased willingness to make more guesses during the trials reflecting a JTC bias.

Barkus et al (2011) reasoned that the false perceptions in their study were more strongly related to hallucinatory predisposition. Similarly, Tsakanikos (2006) reasoned that because their participants' perceptual accuracy remained intact, the mechanisms underlying their false perceptions were likely to be internally generated

events, such as word associations triggered by non-words. In contrast, Colbert et al (2010) reported a JTP bias in an auditory perceptual task in actively and remitted deluded participants and reasoned there may be an association between delusions and impaired judgements about ambiguous sensory stimuli. They suggested that the JTP bias may not be driven solely by the presence of hallucinations and that it may be a trait characteristic in those with a propensity to delusional beliefs. Indeed, a frequent observation in both clinical and non-clinical samples is that delusions and hallucinations are strongly associated with each other (van Os, Hanssen, Bijl, Ravelli, 2000) which perhaps suggests a cross-modal cognitive mechanism underlying the positive symptoms of schizophrenia (Tsakanikos & Reed, 2005).

This is supported by the fact that both biases have independently been found to be exacerbated by emotionally salient material (Dudley et al., 1997; Laroi et al., 2004). While delusions often involve cognitive effort to make sense of aberrant salient experiences, hallucinations often reflect a direct experience of the aberrant salience of internal representations (Kapur, 2003). The author further suggests that in individuals prone to psychosis, cognitive factors are likely to interact with aberrant neurochemistry to determine the different phenomenology of psychosis across different individuals and different disorders. Delusions can precede hallucinations or vice versa, they can develop on their own or at the same time (Compton, Potts, Wan & Ionescu, 2011). Although it is difficult to say with absolutely certainty what underlies the false perceptions in this study, it seems plausible that there could be a JTC, a JTP or an interaction between both biases.

Consider specific examples of false perceptions from the current study. ‘TITANIC’ and ‘WITHER’ did not resemble the words or non-words in the study. This suggests

that the participant may have identified an ambiguous perceptual event as external and real rather than internal and imaginary, i.e. this may have been an example of JTP bias. This is also in alignment with the externality hypothesis (Garety et al, 2001), which asserts that patients higher on the psychosis continuum are more inclined to accept the possibility that an experienced event (such as the word 'TITANIC') is an externally generated event rather than an internally generated input.

The word 'RAPE' was a false perception reported by two participants in the study, perhaps making it less likely that it was solely internally generated. It may have been due to the participants assuming there was an answer and trying to guess more words, perhaps reflecting a JTC bias. They may have seen or been aware of target words such as 'MURDER'. This is in line with the negative correlation between the numbers of false perceptions and correct responses, which suggests there may have been more guesswork.

There may have been other factors involved. For example, there may have been an element of some participants trying to please the researcher by producing more answers. This would be less related to schizotypy psychopathology; however, the fact that positive schizotypy was the only predictor of false perceptions counts against this explanation.

The conundrum in the literature regarding cognitive bias and schizotypy is the difficulty of trying to capture the cognitive bias experimentally, given that each individual has a range of skills and aptitudes across cognitive domains. For this particular word recognition task, the participants who scored high on schizotypy but

did not have any false perceptions may have had a compensatory mechanism that masked the cognitive bias during the task.

#### *4.6.1.2 Early-age trauma and life events as predictors of false perceptions*

The early-age trauma and life events score was not predictive of the number of false perceptions. A correlation might have been expected as studies have found significant and graded associations between histories of early-age trauma and hallucinations (see Read et al. 2006 for a review) with a five-fold increase in the risk of reporting hallucinations when there have been seven or more adverse events (Whitfield et al., 2005). This is in line with literature that has found that hallucinations are often experienced as involuntary intrusions associated with high affect (Nayani & David, 1996) in which the content can be linked to traumatic experiences (Morrison et al., 2002).

The lack of a correlation in the present study between early-age trauma and the number of false perceptions may simply be due to there being too few participants who admitted experiencing early-age trauma to show a relationship statistically (although the present study did find a correlation between early-age trauma and schizotypy). However, an alternative explanation might be that only a proportion of those who experience trauma go on to experience hallucinations, while for others the consequences may be different (depression, for example). This is in line with the fact that there was a significant correlation between trauma and depression (.369). Of the participants who experienced trauma, those who are more prone to hallucinations will likely have a high positive schizotypy score, while those less prone to hallucinations may have a lower schizotypy score. Conversely, some of those with the high schizotypy scores may not have experienced early-age trauma. If that is the

case, schizotypy score could be a stronger predictor of the number of false perceptions than early-age trauma would be, as reflected in the findings of the present study

#### *4.6.1.3 Anxiety and depression as predictors of false perceptions*

The anxiety scores were not significant in predicting false perceptions. Anxiety often accompanies positive schizotypy but would not be expected to predict false perceptions on its own. A study by Mohanty et al. (2008) demonstrated that although anxious apprehension and anxiety sensitivity had an impact to some extent the relationship between positive schizotypy and attentional interference, none of the anxiety measures were found to fully account for this relationship.

Depression and the number of false perceptions were significantly correlated. However, depression was not a significant predictor of false perceptions and may simply reflect that the depression scores were not independent of positive schizotypy as depression and positive schizotypy were correlated. This means that the correlation between depression and false perceptions may simply reflect the relationship between positive schizotypy and false perceptions. If so, this would account for depression not being a predictor of false perceptions in its own right.

#### *4.6.1.4 Gender or age as predictors of false perceptions*

Gender and age were not significant predictors of false perceptions. This, however, is not in line with other studies. For example, Barkus et al (2007; 2010) found that younger participants who scored highly on positive schizotypy reported significantly more false perceptions compared to other groups. They reasoned that younger



participants seem most vulnerable to the effects of positive schizotypal traits in terms of a signal detection deficit and that schizotypy may have greatest impact closer to the risk period for development of psychotic disorders. The lack of such a result in the current study may perhaps be because there was not a great enough spread in ages, with most participants in their early twenties

#### **4.6.2. Emotional condition**

As was expected, the number of correct responses varied depending on the emotional condition of the word presented. Participants gave significantly more correct responses in the neutral and positive word conditions than in the threat-related and trauma-related ones. However, there were no significant differences between emotional conditions for the incorrect responses or for the false perceptions in either the word trials or the non-word trials.

The finding for correct responses is in line with other studies, which have shown a cognitive bias for negative material in both clinical and non-clinical populations. For example, attentional performance was poorer in those with positive schizotypy when the stimuli were both negative and affective (Mohanty, Heller, Koven, Fisher, Herrington & Miller, 2008). A delay in processing angry facial expressions was found in delusion-prone individuals (Green, Williams, & Davidson, 2001); and individuals with delusions had slower reaction times when naming the colour of affective or paranoia-relevant words in a Stroop task (Fear, Sharp, & Healy, 1996; Klumpp, Keller, Miller, Casas, Best & Deldin, 2010). Based on studies such as these, the lower number of correct responses in the threat-related and trauma-related word conditions may be explained in terms of a processing delay with negative affective material.

On this basis it might be expected that such a processing delay would result in a similar difference between the neutral/positive and threat-related/trauma-related emotional conditions for incorrect words. However, no significant differences were found. This may simply be because of the low number of incorrect responses per individual ( $M = 2.3$ , as opposed to  $M = 24.8$  for correct responses), which may have concealed any possible differences.

Again, the total number of false perceptions was low per individual ( $M = 1.7$ ), which may account for no significant differences being found between the emotional conditions.

#### **4.6.3. Positive schizotypy**

##### *4.6.3.1 Early-age trauma and positive schizotypy*

The current study identified an association between schizotypy and early age trauma/negative life events—particularly sexual abuse and negative life events. This was expected and is in accordance with the literature for schizophrenia and trauma, supporting the continuum hypothesis.

It is even possible that the strength of the association found in the current study may have been an underestimate. Longitudinal follow-up of adults whose childhood abuse was documented and corroborated has shown that retrospective reporting of childhood abuse is likely to be an underestimate (Della Femina, Yeager & Lewis, 1990; Williams 1995). However, the moderate correlation found in this study may also reflect the lower rates of prevalence in combination with a relatively small sample size.

#### 4.6.3.2 *Depression or anxiety and positive schizotypy*

An association was found between positive schizotypy and depression but no association was found with anxiety.

Anxiety and depression are known to be associated with symptoms of psychosis and are understood to pose as risk factors in the transition to more clinical symptoms. Anxiety and depression are also associated with positive schizotypy especially when there has been a greater exposure to trauma and/or negative life events (Norman and Malla, 1994). However, the literature on anxiety and depression is mixed. It has also been found that anxiety and depression can result from underlying psychosis (Garety et al., 2001) which may be the case for some of the participants in this study.

#### 4.6.4. **Implications**

The results of Study I provide support in several respects for earlier research related to positive schizotypy, including positive schizotypy as a predictor of false perceptions and the possible role of negative emotion in this. If negative affect is important to the development of cognitive bias, furthering the possibility of transitioning on the continuum, then it would be important to know which factors are important in increasing negative affect.

In this study, early-age trauma—specifically sexual abuse and negative life events—predicted positive schizotypy. The fact that trauma has been found to be a significant predictor of schizophrenia in longitudinal and large population studies and is also associated with positive schizotypy suggests that the risk for developing psychotic symptoms may be elevated in those high in schizotypy who also present with past traumatic experiences. Together these findings suggest that assessments could be

improved by considering trauma and depression as well as distortions in thinking. In turn this may provide direction for treatment aimed at treating prodromal or sub-clinical positive symptoms significant for early intervention.

Elucidating the potential links between positive schizotypy, emotion, cognitive bias, trauma, anxiety and depression could help to recognise potential risk factors pertinent to the various developmental trajectories, particularly schizophrenia. This is important because identifying factors that may ultimately link with psychosis could lead to greater vigilance and earlier intervention, which has been demonstrated to improve treatment outcome.

#### **4.6.5. Limitations**

The experimental method was successful in eliciting false perceptions. It was simple and reasonably quick to administer and the participants understood the process and responded receptively with minimal prompting.

A limitation of the current study is that the sample was primarily university and high school students. Thus, the sample was somewhat limited in age and education. Although participants endorsed a broad range of schizotypy, university students tend to be high functioning. Therefore, the results may not be generalisable to those who have subclinical experiences and are lower functioning.

While this cross-sectional study was able to find significant associations between variables, cause could not be established with this particular design.

The target words and their emotional conditions were taken from a standardised list used in a previous study, but some of the choices of emotional condition are

debatable. For example, it could be argued that that the word SEX may not be trauma-related, particularly for a young and non-clinical population. However, for those participants where trauma is an issue, the word SEX may indeed have had a negative influence on their response. Therefore, in Study II we employed independent ratings of all the target words, which may clarify issues such as these.

#### **4.7. Conclusion**

This study investigated cognitive bias and the role of emotion in this, and confirmed earlier research suggesting that positive schizotypy is a predictor of the cognitive bias—false perceptions—reported by participants. It also established that the task the participants undertook could be influenced by the emotional condition of the words presented in that task, in that negative emotional words were associated with significantly fewer correct answers.

Study II now goes further in investigating the relationship between cognitive bias and emotion and explores the emotionality of the words reported as false perceptions, and how this emotionality might relate to the emotional condition of the trials and to the individual participants' questionnaire data.

## **5. Study II: The emotional content of false perceptions**

### **5.1. Overview of Study II**

The main aim of Study II was to obtain independent ratings of the emotionality of the false perceptions reported in Study I to allow the investigation of possible correlations between these and the positive schizotypy, early-life trauma, depression and anxiety scores of the Study I participants. The methodology also allowed a comparison between Counselling and Psychotherapy Practitioners and non-therapists in how they rated the emotionality of the words.

Twelve Counselling and Psychotherapy Practitioners and twelve non-therapists rated the target words and false perceptions using two scales: the Assessment of Emotional Intensity (Strauss & Allen, 2008) and the Semantic Differential Scale (Osgood, 1962).

The therapists rated the Emotional Intensity of words significantly higher than the non-therapists, particularly the threat-related and trauma-related words and false perceptions, suggesting that they may have higher receptivity to negative emotional content of such perceptual experiences.

A correlation between positive schizotypy scores of Study I participants and the Emotional Intensity, Activity and Potency ratings of the false perceptions they reported suggests that schizotypy is associated with generating false perceptions with higher emotional content. This is a novel finding supporting the idea that false

perceptual experiences have a higher emotional content akin to clinical hallucinations.

## **5.2. Rationale and context for Study II**

Positive schizotypy and positive symptoms in schizophrenia are associated with the processing of emotional information (Mohanty, Koven, Fisher, Herrington, Stewart, Heller & Miller, 2001; Kerns, 2005), with a bias for negative material, including threat, anger and sadness (Phillips, Williams, Senior, Bullmore, Brammer, Andrew, Williams & David, 1999; Mandal, Jaine, Haque-Nizamie, Weiss & Schneider, 1999). This may be reflected in the emotional content of the false perceptions reported in Study I.

Study II investigated this through recruiting a panel of therapists and non-therapists to rate each false perception word for its Emotional Intensity and Emotional Valence, using standard scales. The results were then used to investigate possible correlations with the Study I participants' schizotypy scores.

The benefit of having mental health professionals rate the emotional content of false perceptions is that the evaluation of the emotional content of both verbal and nonverbal communication is an essential part of the clinical work of Counselling and Psychotherapy Practitioners. However, the participants in Study I were not therapists and it might be argued that therapists' ratings of words may not be representative of the participants. Having a panel of both therapists and non-therapists allowed a comparison to be made between these two groups and provided greater confidence in the results. Asking the panel to rate all the target words from Study I as well as the

false perceptions broadened the comparison and also allowed the emotional word conditions of the target words to be checked for validity and specificity.

Two standard scales were used to rate the words: the Assessment of Emotional Intensity (Strauss & Allen, 2008), an approach that has shown good validity and reliability in assessing the emotional content of words, and the Semantic Differential Scale (Osgood, 1962). The advantage of using the Semantic Differential Scale methodology is that it is considered to be a culturally fair approach used to assess the emotional meaning of perceptions across different cultures (Tzeng, Landis & Tzeng, 2012), which has been employed previously in schizophrenia research (Hayashi, Yamashina, Ishige, Taguchi, Igarashi, Hiraga & Inoue, 2000). The three factors, Evaluation (good-bad), Potency (strong-weak) and Activity (active-passive), have been commonly found across cultures and stimulus domains (see Tzeng et al., 2012 for a review) and scores on these factors have been differentially associated with cortical activity during rating of stimuli containing affective content (Suzuki, Gyoba & Sakuta, 2005).

### **5.3. Research questions**

There were two primary research questions for Study II.

The first considers possible differences between the therapists and the non-therapists in their ratings of the target words and false perceptions. For example, the therapists with their professional training and greater awareness of their emotions may rate the target words and false perceptions with greater sensitivity to emotionality than the non-therapists. This may also vary according to the word condition of the target



words (positive, neutral, threat-related and trauma-related), or whether the word was a false perception.

1. Do the therapists' mean Emotional Intensity and Emotional Valence ratings for the different word conditions (positive, neutral, threat-related and trauma-related target words, and false perceptions) differ from the mean ratings of the non-therapists?

The second research question links the ratings for the individual false perception words with the Study I questionnaire data of the participants who reported those words. It was expected that the participants with higher schizotypy scores may report false perceptions that received higher emotionality ratings.

2. Is there an association between the ratings for Emotional Intensity and Emotional Valence of the false perceptions reported by Study I's participants and those participants' schizotypy scores? What is the contribution of anxiety, depression or early-age trauma scores?

## **5.4. Methodology**

### **5.4.1. Design**

The design for the first research question was a 2 (professional group: therapist vs. non-therapist) x 5 (word condition: positive, neutral, threat-related, trauma-related, false perception) mixed ANOVA, with "group" as a between- and word "condition" as a within-subject factor.

The dependent variables are the participants' ratings for Emotional Intensity, Evaluation, Activity and Potency.

#### **5.4.2. Participants**

In total, 24 participants (N = 15 female and N = 9 male) took part in Study II. Their ages ranged from 19 to 51 (M = 33.1, SD = 9.4). They were in two groups:

Twelve Counselling and Psychotherapy Practitioners with greater than two years' experience (N = 7 female and N = 5 male), aged 26 to 51 (M = 39.3, SD = 8.6). These were recruited from an NHS Trust and from a voluntary counselling placement.

Twelve non-therapists (N = 8 female and N = 4 male), aged 19 to 35 (M = 26.7, SD = 5.1). These were reception staff or psychology graduates with no further clinical training.

#### **5.4.3. Measures**

*Assessment of Emotional Intensity* (Strauss & Allen, 2008). Participants rated each word on a 7-point Likert scale, with 1 indicating 'not very emotional' and 7 indicating 'very emotional'. Categorisation instructions asked participants to select one of eight discrete emotional categories ('happiness', 'sadness', 'anger', 'anxiety', 'fear', 'disgust', 'surprise' and 'neutral') that they felt most highly represented the word presented. This methodological approach has shown good validity and reliability in assessing the emotional content of words (Strauss & Allen, 2008).

*Semantic Differential Scale* (Osgood, 1962). This consists of three factors: Evaluation (good-bad), Potency (strong-weak) and Activity (active-passive), each rated in this

study on a 7-point Likert scale with 1 indicating ‘bad’, ‘weak’ or ‘passive’ respectively, and 7 indicating ‘good’, ‘strong’ or ‘active’.

#### **5.4.4. Procedure**

The participants were given a formatted list of all 32 target words and 105 false perceptions from Study I, with clear instructions on how to rate the words. Each word was accompanied by four Likert scales numbered from one to seven between pairs of opposing adjectives (for example, ‘not very emotional’ to ‘very emotional’ or ‘bad’ to ‘good’) with the neutral point on the centre line, along with a list of the eight word categories (see Appendix VI for a sample of the word list and the instructions). The participants were asked to mark the scales according to their ratings of the words, and to circle the word category that that they felt most highly represented the word presented. The words were listed in the order ‘positive’, ‘neutral’, ‘threat-related’ and ‘trauma-related’ target words and then the false perceptions, though the participants were not made aware of this. Both tasks could be completed on paper or on a computer.

#### **5.4.5. Data analysis**

For each participant, mean ratings were calculated for Emotional Intensity, Evaluation, Activity and Potency for all four conditions of the target words and the false perceptions. These mean ratings could then be compared between the therapists and the non-therapists and across the word conditions using mixed ANOVAs.

For each false perception word, the means of all the participants’ ratings were calculated for Emotional Intensity, Evaluation, Activity and Potency. These mean scores were combined in a new database with the questionnaire data of the Study I

participants' who reported those words as false perceptions. This allowed for looking into potential associations between the word ratings and the questionnaire data such as schizotypy scores, early-life trauma as well as depression and anxiety.

## 5.5. Results

### 5.5.1. Descriptive data

Table 5.1 summarises the mean ratings on the Assessment of Emotional Intensity scale for the therapists and non-therapists for all the words combined. Table 5.2 summarises the mean ratings for the Semantic Differential Scale.

Table 5.1

*Mean and standard deviation (SD) ratings of therapists and non-therapists for Emotional Intensity across all words*

		Mean	SD
<b>Emotional Intensity</b>	Therapists	4.59	.36
	Non-therapists	3.81	.82

Table 5.2

*Mean and standard deviation (SD) ratings of therapists and non-therapists for Evaluation, Activity and Potency across all words.*

		Mean	SD
<b>Evaluation</b>	Therapists	4.00	.18
	Non-therapists	4.00	.16
<b>Activity</b>	Therapists	4.62	.25
	Non-therapists	4.52	.25

<b>Potency</b>	Therapists	4.62	.23
	Non-therapists	4.51	.25

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Visual inspection of histograms of the mean scores for each of the 24 participants for each of the word conditions for Emotional Intensity, Evaluation, Activity and Potency (i.e. the data to be used in the ANOVAs) showed that the data were not normally distributed, as is virtually inevitable with data sets containing only 24 items. However, in general the histograms were roughly symmetrical, with a tendency for higher frequencies nearer the centre of the distribution and lower frequencies towards the edge. The histograms did not show anything like the same level of skewness as seen in the data for incorrect responses and false perceptions in Study I. Although ANOVA assumes normally distributed data, it is well established that its results are not sensitive to a degree of deviation from this assumption. It was therefore judged that the data were suitable for ANOVA analysis.

### **5.5.2. Comparing the ratings between therapists and non-therapists and between the word conditions**

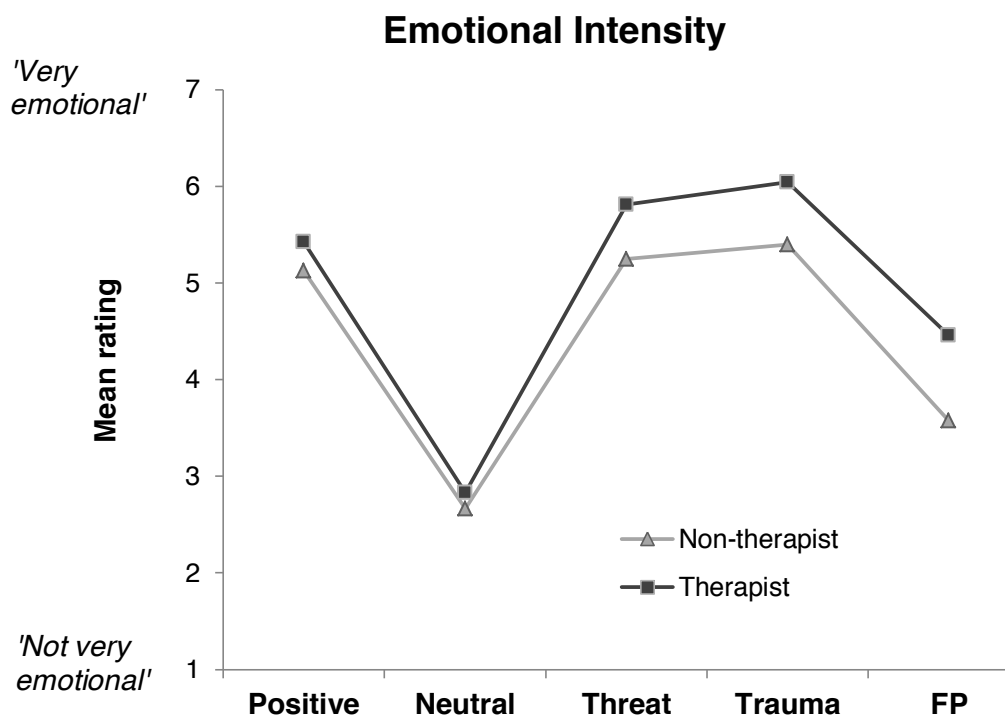
Four mixed ANOVAs were carried out, one each for Emotional Intensity, Evaluation, Activity and Potency. Each ANOVA was 2 x 5, with the between-subject variable being 'professional group' (therapist vs. non-therapist) and the within-subject variable being the 'word condition' (positive, neutral, threat-related, trauma-related and false perception). This tested for differences between the therapists' and non-therapists' ratings across the word conditions, for differences between the ratings of the word conditions, and for any interaction between professional group and word condition

### 5.5.2.1 Emotional Intensity

The mean Emotional Intensity ratings for the therapists and non-therapists for each target word condition and the false perceptions are plotted in Figure 5.1. Neutral target words received lower mean ratings than the positive, threat-related and trauma-related words, as would be expected. On average, the therapists gave higher Emotional Intensity ratings throughout, and the difference appears to be greater for threat-related and trauma-related target words and for the false perceptions.

Figure 5.1

*Mean ratings of the therapists and non-therapists for Emotional Intensity across the four target word conditions and false perceptions (FP).*



The 2 x 5 mixed ANOVA revealed a **main effect of professional group**,  $F(1,22) = 7.4$ ,  $p < .05$ . This suggests that, ignoring the word condition, the therapists rated the words on Emotional Intensity differently to the non-therapists.

The assumption of sphericity was not met; using the Greenhouse-Geisser correction revealed a **main effect of ‘word condition’**,  $F(2.0,44) = 87.8$ ,  $p < .001$ , i.e. the ratings differed across the word conditions.

However, despite there being differences across the word conditions and between the therapists and non-therapists in their ratings, there was no statistically significant interaction between ‘word condition’ and ‘professional group’ ( $F_s < 1$ ).

Post hoc testing using t-tests for each of the five word conditions (at a Bonferroni corrected significance threshold of  $p < .01$ ) showed a **significant difference between therapists’ and non-therapists’ mean ratings for false perceptions** ( $t = 2.988$ ,  $p < .01$ ). The difference between their ratings for **trauma-related words** was close to being statistically significant with this Bonferroni correction ( $t = 2.755$ ,  $p = .012$ ).

Post hoc testing was carried out using pairwise comparison t-tests of the mean combined ratings of the therapists and non-therapists for all ten possible pairings of the target word conditions (at a Bonferroni corrected significance threshold of  $p < .005$ ). This showed significant differences between all pairings ( $t$  values ranging from 3.9 to 11.1,  $p < .005$ ) except between positive and threat-related conditions and between threat-related and trauma-related conditions ( $p > .005$ ).

#### 5.5.2.2 *Evaluation*

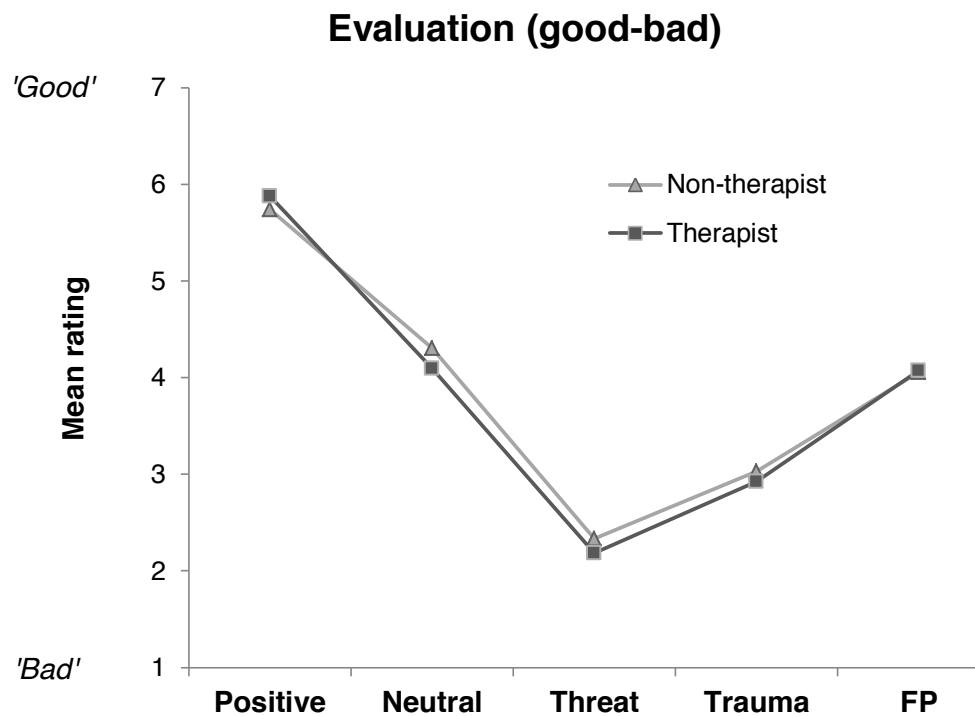
The mean Evaluation ratings are shown in Figure 5.2. As expected, positive target words were rated towards the ‘good’ end of the scale and the threat-related and

trauma-related target words towards the 'bad' end. There is close consistency between the therapists' and non-therapists' mean ratings.

The 2 x 5 mixed ANOVA showed no significant main effect of professional group. The assumption of sphericity was not met; using the Greenhouse-Geisser correction revealed **a main effect of word condition**,  $F(2.4,53) = 193$ ,  $p < .001$ , i.e. the ratings differed across the word conditions. There was no significant interaction between 'word condition' and 'professional group'.

Figure 5.2

*Mean ratings of the therapists and non-therapists for Evaluation across the four target word conditions and false perceptions (FP).*



Post hoc testing was carried out using pairwise comparison t-tests of the mean ratings of the therapists and non-therapists combined for all ten possible pairings of



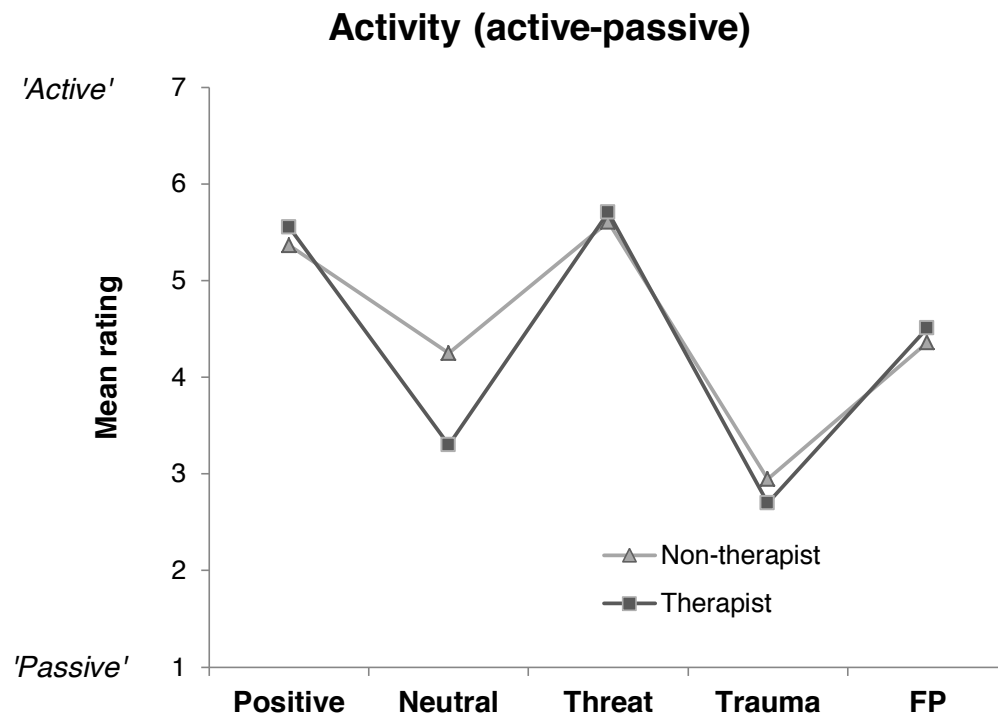
the target word conditions (at a Bonferroni corrected significance threshold of  $p < .005$ ). This showed significant differences between all pairings ( $t$  values ranging from 5.1 to 19.6,  $p < .005$ ) except between neutral and false perception conditions ( $p > .005$ ).

#### 5.5.2.3 *Activity*

The mean ratings for Activity are shown in Figure 5.3. Positive and threat-related target words were rated the most active, trauma-related words were rated the least active, and there was close consistency between therapists and non-therapists except for the neutral target words, which the non-therapists appear to have rated more active than the therapists.

Figure 5.3

*Mean ratings of the therapists and non-therapists for Activity across the four target word conditions and false perceptions (FP).*



The 2 x 5 mixed ANOVA showed no significant main effect of professional group. The assumption of sphericity was not met; using the Greenhouse-Geisser correction revealed a **main effect of word condition**,  $F(2.4,52) = 56.1$ ,  $p < .001$ , i.e. the ratings differed across the word conditions. There was no significant interaction between 'word condition' and 'professional group'.

Post hoc testing was carried out using pairwise comparison t-tests of the mean ratings of the therapists and non-therapists combined for all ten possible pairings of the target word conditions (at a Bonferroni corrected significance threshold of  $p < .005$ ). This showed significant differences between all pairings ( $t$  values ranging

from 3.4 to 9.7,  $p < .005$ ) except between positive and threat-related conditions ( $p > .005$ ).

#### 5.5.2.4 *Potency*

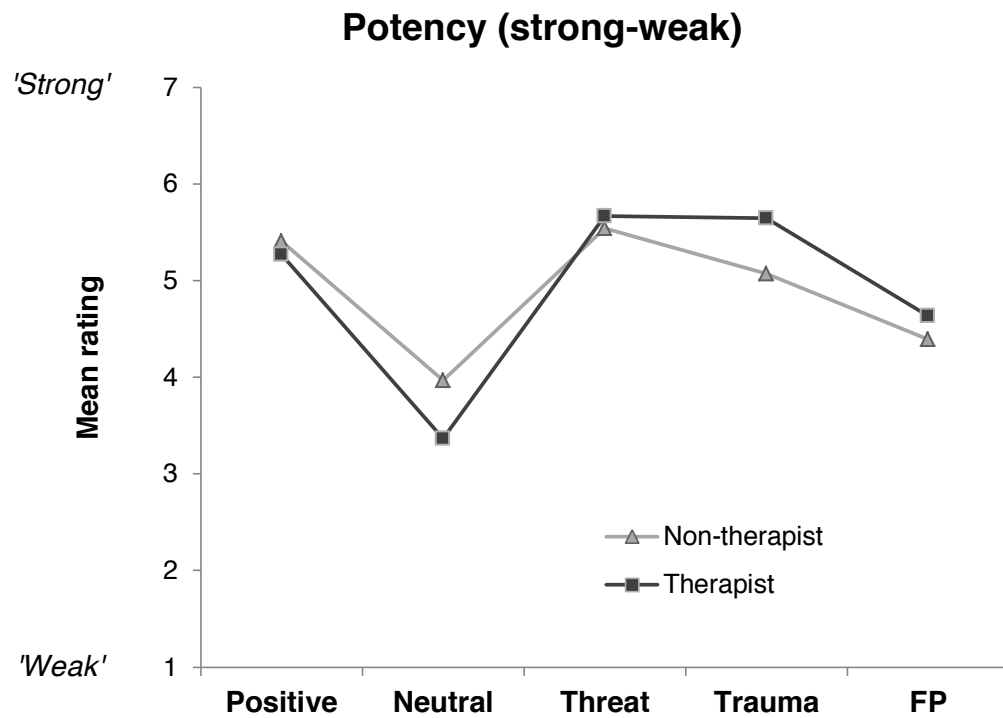
The mean ratings for Potency are shown in Figure 5.4. The mean ratings are all above the mid-point rating of 4 except in the case of the therapists' rating of neutral target words. There appears to be less consistency between the therapists and non-therapists than in their ratings for Evaluation and Activity.

The 2 x 5 mixed ANOVA showed no significant main effect of professional group. The assumption of sphericity was not met; using the Greenhouse-Geisser correction revealed **a main effect of word condition**,  $F(2.0,44) = 38.6$ ,  $p < .001$ , i.e. the ratings differed across the word conditions. There was no significant interaction between 'word condition' and 'professional group'.

Post hoc testing was carried out using pairwise comparison t-tests of the mean ratings of the therapists and non-therapists combined for all ten possible pairings of the target word conditions (at a Bonferroni corrected significance threshold of  $p < .005$ ). This showed significant differences between all pairings ( $t$  values ranging from 4.5 to 7.9,  $p < .005$ ) except between positive and threat-related conditions, positive and trauma-related conditions and threat-related and trauma-related conditions ( $p > .005$ ).

Figure 5.4

*Mean ratings of the therapists and non-therapists for Potency across the four target word conditions and false perceptions (FP).*



#### 5.5.2.5 Summary

Table 5.3 summarises the differences between the four word conditions and false perceptions in terms of Emotional Intensity and Emotional Valence, showing the specificity of the four conditions.

Table 5.3

*Descriptive summary of the Emotional Intensity and Emotional Valence ratings for the four word conditions.*

	<b>Emotional Intensity</b>	<b>Evaluation</b>	<b>Activity</b>	<b>Potency</b>
<b>Positive</b>	High	High	High	High
<b>Neutral</b>	Low	Medium	Medium	Medium
<b>Threat-related</b>	High	Low	High	High
<b>Trauma-related</b>	High	Low	Low	High
<b>False perceptions</b>	Medium	Medium	Medium	Medium

As can be seen from Table 5.3, the mean ratings for the false perceptions were medium in each case. However, the range of results was large, as summarised in Table 5.4.

Table 5.4

*Descriptive data for the emotional ratings of the false perceptions.*

	Minimum	Maximum	Mean	SD
<b>Emotional Intensity</b>	1.75	6.75	3.96	1.16
<b>Evaluation</b>	1.54	6.25	3.95	1.05
<b>Activity</b>	2.00	6.13	4.36	0.79
<b>Potency</b>	2.00	6.17	4.43	0.75

### 5.5.3. Emotional Category

The participants were asked to assign an emotional category to each target word and false perception. The most commonly chosen category was found for each word individually, and these were counted for the eight words in each target word condition, and for the entire list of false perceptions. The results are summarised in Table 5.5. It can be seen that 19 of the false perceptions were assigned the positive category ‘happiness’, 27 were assigned negative emotional categories, and the remainder were considered ‘neutral’.

Table 5.5

*Number of times each emotional category was the most commonly chosen by the 24 participants, by target word condition and false perceptions.*

	Positive	Neutral	Threat-related	Trauma-related	False perceptions
Happiness	8	1	-	1 <sup>a</sup>	19
Sadness	-	-	1	2	9
Anger	-	-	2	2	6
Anxiety	-	-	2	-	8
Fear	-	-	3	1	3
Disgust	-	-	-	2	1
Surprise	-	-	-	-	-
Neutral	-	7	-	-	59

<sup>a</sup> This was the word ‘SEX’, as discussed in section 4.6.5.

### 5.5.4. Further investigation of the Emotional Intensity ratings

As the ANOVA revealed a significant effect in the ratings of the Emotional Intensity of words between therapists and non-therapists, this was investigated further.

The Emotional Intensity ratings were compared between genders. There was no significant difference.

The therapists were, on average, older than the non-therapists. This raises the question of whether the differences in Emotional Intensity ratings could be due to the age difference rather than the participants' professional group. The data were therefore tested for correlations between the non-therapists' ages and their mean ratings, and between therapists' ages and their ratings. In both cases, there was no significant correlation. This suggests that age is not in itself a predictor of mean ratings, and that the difference between the therapists' and non-therapists' is indeed due to their professional group. This was confirmed using ANCOVA analysis with age as the covariate, which showed that age did not have a significant effect ( $F = 139, p = .713$ ). The data for the therapists and non-therapists are shown in Figure 5.5 on the following page.

Given that the ANOVA and post hoc analysis showed that therapists tended to give higher Emotional Intensity ratings than non-therapists, it might be expected that they would categorise fewer words as 'neutral'. The number of times each participant categorised a word as 'neutral' was therefore counted, as summarised in Table 5.6.

Figure 5.5

*Scatterplot showing the mean Emotional Intensity ratings of the therapists and non-therapists plotted against their ages. There was no correlation between the therapists' ratings and age, or between the non-therapists' ratings and age*

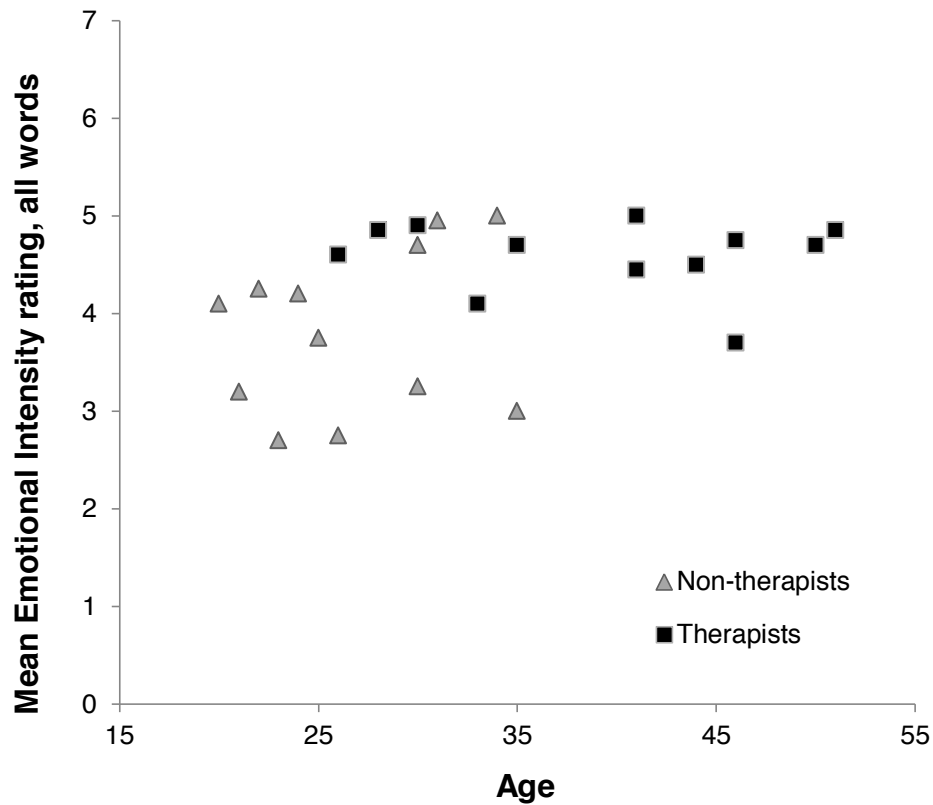


Table 5.6

*Mean and standard deviation (SD) for therapists and non-therapists of the number of words categorised as 'neutral'.*

	Mean no. of words categorized as 'neutral'	SD
Therapists	40.9	10.9
Non-therapists	58.5	11.1

The therapists' and non-therapists' mean counts were compared using an independent t-test. This revealed **a significant difference between the therapist and non-therapist in the number of times they categorized a word as 'neutral'** ( $t = 3.902$ ,  $df=22$ ,  $p < .001$ ).



#### **5.5.5. Correlations between the ratings for false perceptions and positive schizotypy, early-age trauma, anxiety and depression**

The means of all the participants' ratings—therapists and non-therapists combined—for each false perception word were calculated for Emotional Intensity, Evaluation, Activity and Potency. Where Study I participants had occasionally reported as false perceptions words that happened to be among the target words (see section 4.5.1.2), these were added to the list of false perceptions for this part of the study.

These mean scores were linked, word by word, with the questionnaire data of the Study I participants who had reported those words as false perceptions. Where two participants had reported the same word as a false perception, the link was made with both participants.

Correlation analysis was then carried out between the mean word ratings and scores for positive schizotypy, early-age trauma, depression and anxiety. As the data distributions for schizotypy, early-age trauma and depression deviated considerably from the normal distribution (as described earlier in section 4.5.1.1), Spearman correlation analysis was used for these, with Pearson analysis used for the normally distributed anxiety data.

There were correlations between schizotypy scores and the mean ratings for the false perceptions of Emotional Intensity (.311,  $df = 51$ ,  $p < .05$ ), Activity (.340,  $df = 51$ ,  $p < .05$ ) and Potency (.369,  $df = 51$ ,  $p < .01$ ), but not for the mean rating for Evaluation.

There were no significant correlations between early-age trauma scores and the word ratings.

There were no statistically significant correlations between depression scores and the word ratings. However, there was a correlation between anxiety and the Activity ratings for the false perceptions ( $.291$ ,  $df = 51$ ,  $p < .05$ ).

## **5.6. Discussion**

### **5.6.1. Therapists vs non-therapists**

The Study I target words and false perceptions needed to be rated for their emotionality and this gave an opportunity to look for differences between therapist and non-therapists. Due to therapists' training it might be expected that therapists would be more in touch with their emotions and show greater discernment in their emotional ratings of words.

As was expected, there was a significant overall difference between therapist and non-therapist in their ratings of Emotional Intensity. In particular, the therapists rated the threat-related and trauma-related words and false perceptions significantly higher in Emotional Intensity than the non-therapists. However, there were no significant differences between the therapists' and non-therapists' ratings for Evaluation, Potency and Activity. It is perhaps not a surprise that it was the threat-related and trauma-related words that were rated with higher intensity by the therapists as their professional training and development requires a greater degree of sensitivity and reflectivity to negative feelings (Vetere & Dallos, 2012).

Although the therapists were on average older than the non-therapists, analysis showed that age could not account for the difference. The difference cannot be

explained by gender either as the numbers of men and women taking part were similar between therapist and non-therapists.

In terms of the Semantic Differential Scale, there was close agreement between therapists' and non-therapists' ratings for Evaluation, Potency and Activity, which suggests that there may be less variability across the population in differentiating between good and bad, strong and weak, or active and passive than in judging emotional intensity. This may add further support for the reliability for Semantic Differential Scale, showing it is not dependent on the qualifications and backgrounds of those carrying out the rating.

#### **5.6.2. Differences between the emotional conditions of the target words and the false perceptions**

Significant differences between each of the in the categories were found between all pairings except between positive and threat-related conditions and between threat-related and trauma-related conditions.

The results also confirm the specificity of each of the categories of words (positive, neutral, threat-related and trauma-related), as summarised earlier in Table 5.3. With Emotional Intensity, the positive, threat-related and trauma-related words were rated as being 'emotional', as would be expected, while the neutral words were 'not very emotional'. With Evaluation, threat-related and trauma-related words were rated as 'bad' while positive words were rated as 'good'; for Activity, positive and threat-related words were rated as 'active' while trauma-related words were rated 'passive'; and for Potency, positive, threat-related and trauma-related words were all rated as 'strong'. Unsurprisingly, neutral words received medium ratings for Evaluation,

Activity and Potency. The fact that each of the four word conditions had a distinct profile across Evaluation, Activity and Potency supports the validity of Blix and Blennan's (2012) categorisation of words. It also supports the usefulness of the Emotional Intensity and Semantic Differential Scale in differentiating between emotional word conditions, and therefore a good tool for investigating the false perceptions.

The mean ratings for false perceptions were medium across Emotional Intensity and the Semantic Differential Scale. However, as might be expected, there was a considerable range in the ratings of the individual false perceptions (as summarised earlier in Table 5.4), suggesting that false perceptions contained mix of different types of words. For example, 'ARCH' and 'VEST' were rated low in Emotional Intensity and medium in Emotional Valence, while 'ILLNESS' and 'ENVY' received high ratings. This variation allowed the ratings for the false perceptions to be used in correlations with the data collected in Study I.

### **5.6.3. The emotional ratings and positive schizotypy, depression, anxiety and early-age trauma**

Moderate correlations were found between the Study I participants' positive schizotypy scores and the mean ratings for the false perceptions of Emotional Intensity, Activity and Potency, but no correlation with the mean rating for Evaluation. In other words, the false perceptions of participants with higher levels of schizotypy tended to be more emotionally intense, active and strong, but with no predominance of good or bad according to the Evaluation scale (although, as shown earlier in Table 5.5, more false perceptions were categorized in the negative emotional categories than in the positive category).

There was also a mild correlation between anxiety and the Activity ratings. However, there were no other correlations with early-age trauma, anxiety or depression.

As discussed in Chapter 4, false perceptions may be mild expressions of hallucinations or delusions. Given that the content of delusions and hallucinations experienced by those with schizophrenia is often emotional and distressing, it might be expected that the false perceptions of those higher in schizotypy would be more emotional than with lower schizotypy.

A possible explanation according to the aberrant salience hypothesis (see Chapter 2), is that dysregulated dopamine levels in schizophrenia can result in undue salience being given to neutral external stimuli and internal representations and this can lead to deluded thinking (Kapur, 2003). Negative internal emotional states can be projected externally and perhaps schizotypy involves an attenuated form of dopamine dysregulation.

However, there was no correlation between schizotypy score and Evaluation, i.e. how ‘good’ or ‘bad’ the false perceptions were rated to be. This was unexpected as the literature shows that delusions and hallucinations tend to be negative in their emotional content (Beavan & Read, 2010). However, more false perceptions were assigned negative emotional categories than positive (27 vs. 19). A possible explanation for the result with Evaluation may simply be that a few false perceptions rated as ‘good’—and therefore at the opposite end of the Likert Scale to ‘bad’—would be sufficient to mask any correlation.

No correlations were found between the emotional ratings and early-age trauma or depression. This shows that the emotional content of the false perceptions may be

more closely related to schizotypy than to these. The mild correlation found between anxiety scores and the Activity rating of the false perceptions, but not the Emotional Intensity, Evaluation and Potency ratings, was unexpected. A possible explanation may be that internal states of anxiety mobilise adrenaline, perhaps predisposing those individuals to generate more active words—or this weak correlation may simply be a chance finding.

#### **5.6.4. Implications**

Delusions and hallucinations in schizophrenia tend to have high emotionality, often negative. The finding in this study that the false perceptions of some individuals scoring higher on positive schizotypy have greater emotional content may suggest a potential predisposition in those individuals for moving higher along the schizophrenia continuum, particularly if they have other risk factors such as a history of trauma or negative life events, or higher depression and anxiety scores. Reasoning or perceptual biases can further impact on this vulnerability which can put an individual over their threshold for coping. If anxiety and stress begin to escalate and dopamine release becomes dysregulated this can further the process of psychotic symptoms, and so it is important to identify and help such people at as the earliest possible stage.

The fact that the therapists in this study tended to have greater emotional sensitivity than the non-therapists could impact on their ability to pick up early warning signs, such as heightened anxiety and fear. Unfortunately, not all first line staff have the degree of training as therapists, which may raise issues over detection of early signs and symptoms.

### **5.6.5. Critique and limitations of Study II**

The methodology for rating the words, using formatted lists that could be completed on paper or online, provided a straightforward way to compare the therapists and non-therapists. It was not overly burdensome for the participants, and it showed a clear difference between therapists and non-therapists in their Emotional Intensity ratings.

However, the comparison between therapists and non-therapists might have been stronger if the two groups had been more closely matched for age and gender. Although the statistical argument set out in section 5.5.4 ruled out the possibility that the difference in Emotional Intensity ratings between the therapists and non-therapists was due to the greater mean age of the therapists—as there were no correlations between age and ratings for either the therapists as a group or the non-therapists, and through ANCOVA analysis—matching the ages of the participants in the two groups more closely would have made this analysis unnecessary. Unfortunately, time constraints and recruitment difficulties meant matching the participants was not possible in practice.

Another improvement that may have produced a stronger comparison would have been ensuring a greater differential between the experience of the therapists and the non-therapists. In the study, the therapists all had two or more years of professional experience. Some of the non-therapists were psychology graduates. Recruiting therapists with, say, five years of experience and non-therapists with no psychological training at all may have resulted in a greater difference between the two groups. Again, this was not possible in practice at the time of the study.

Using the Assessment of Emotional Intensity and the Semantic Differential Scale seemed to capture the emotionality of the words, producing ratings that varied in a manner that might have been expected (for example, the positive words were rated more emotional across all the scales than were the neutral words). However, the study raised questions about the robustness of the Semantic Differential Scale. Using this scale involves considerable subjectivity, and the participants' personal experiences may have affected their interpretation of the words. For example, the false perception 'WITHER' was rated by some participants to be 'active' and by others to be 'passive', and by some to be 'strong' while others thought it 'weak'. Subjective variations such as these may have reduced the strength and usefulness of results.

Investigating the relationship between the emotional ratings for the false perceptions and the positive schizotypy and other scores of the Study I participants resulted in a significant correlation between schizotypy score and Emotional Intensity, as expected, meaning the false perceptions were indeed rated as emotional. There was no association between schizotypy score and Evaluation i.e. good—bad. This perhaps lends support for the continuity hypothesis as you would expect the degree of emotion to correlate with where individuals are on the continuum. With more clinical populations you may expect there to be a stronger association with Evaluation. The participants for Study I were recruited from a normal, nonclinical population. The fact that individuals higher in positive schizotypy experienced false perceptions rated higher in emotionality suggests there may be some underlying risk which could eventually translate into more negative evaluations if other relevant risk factors are present.



### **5.6.6. Conclusion**

This study showed a significant difference between therapists with two or more years' experience and non-therapists. The therapists rated threat-related and trauma-related words significantly higher in Emotional Intensity than did the non-therapists, suggesting that they may have higher receptivity to negative emotion.

The correlation between positive schizotypy scores of Study I participants and the Emotional Intensity, Activity and Potency ratings of the false perceptions they reported suggests that schizotypy is associated with generating false perceptions with higher emotional content. This is consistent with the well-established finding that delusions and hallucinations in individuals with schizophrenia tend to have high emotional content. However, this study did not find false perceptions to have predominantly negative (bad) emotional content, as is often the case with delusions and hallucinations which is perhaps more in line with a non clinical population.

Study I found that higher levels of positive schizotypy were associated with a greater number of false perceptions generated, and Study II showed that positive schizotypy was associated with greater emotional content in the false perceptions. The final chapter of this thesis brings these findings together and discusses them in the framework of cognitive bias, emotion and the schizophrenia continuum.

This study used standard psychological questionnaires and a word recognition task to investigate whether positive schizotypy was a predictor of the number of false perceptions in a non-clinical sample. The study also looked at other factors that may be associated with the number of false perceptions reported, including early-life trauma, depression and anxiety.

The word recognition task involved a series of 127 trials each containing random sets of letters or target words from a list. Each target word belonged to one of four emotional conditions: neutral, positive, threat-related, or trauma-related. The dependent variables measured were the numbers of correct responses, incorrect responses and false perceptions.

Analysis showed a significant correlation between positive schizotypy and false perceptions and a mild correlation between depression and false perceptions. However, multiple regression analysis showed only positive schizotypy to be a predictor of false perceptions. There were also moderate correlations between positive schizotypy and early-life trauma and between positive schizotypy and depression. These results confirmed that, in a non-clinical sample, positive schizotypy scores indeed predicted false perceptions in the word recognition task, replicating past evidence (Bentall & Slade, 1985; Cahill, et al., 1996; Rankin & O'Carroll, 1995; Tsakanikos & Reed, 2005a; Tsakanikos & Reed, 2005b).



## **6. Overall conclusions**

### **6.1. Summary of the findings of Studies I and II**

The present studies used a word recognition task in which non-clinical participants tried to identify target words of four emotional conditions (positive, neutral, threat-related and trauma-related). During this, some of the participants reported false perceptions, i.e. words that were not among the target words. The emotional content of these false perceptions was then rated by a panel of therapists and non-therapists according to standard scales, and the number of false perceptions and their emotional ratings were related to the positive schizotypy, depression, anxiety and early-age trauma scores of the participants obtained from questionnaires.

In summary, the main findings were:

1. As expected, positive schizotypy scores independently predicted the number of false perceptions in the word recognition task. There were also correlations of the number of false perceptions with depression and trauma, but multiple regression showed only positive schizotypy to be a predictor of false perceptions, with no issues of collinearity with the other two variables. Significant correlations were found between schizotypy scores and the mean false perception ratings for Emotional Intensity, Activity and Potency, but there was no correlation with the mean rating for Evaluation (although a greater number of false perceptions were assigned negative emotional categories than positive by the panel). These findings suggest that individuals with positive schizotypy are more likely to generate false perceptions and that these false perceptions have a higher emotional content.

2. Participants reported fewer correct responses in the threat-related and trauma-related conditions than in the neutral and positive emotional conditions (but there were no significant differences for incorrect responses and false perceptions). This suggests that negative emotion may interfere with perceptual and/or cognitive processes.

3. There were significant correlations between positive schizotypy and early-age trauma with sexual abuse and negative life events the strongest predictors. This confirms that early-age trauma can be a risk factor for schizotypy, as it is for schizophrenia. The fact that depression correlates with both positive schizotypy and trauma but was not found to be a significant predictor is also in line with research that suggests that depression can act as a mediator and may be significant in the transition to the more clinical side of the continuum.

4. The therapists rated the Emotional Intensity of words significantly higher than the non-therapists, particularly the threat-related and trauma-related words and false perceptions, suggesting that therapists, as would be expected, are more sensitive than non-therapists to negative emotions.

## **6.2. Relating the findings to cognitive bias, emotion and the schizophrenia continuum**

Chapter 1 outlined the hypothesis that schizotypy lies on a continuum with schizophrenia, with many people experiencing what might be considered attenuated, non-clinical forms of the symptoms of psychosis. This makes schizotypy an important subject for study, both for the light it can shed on schizophrenia and because it is important to identify individuals prone to schizophrenia, especially

those with additional risk factors such as early-age trauma, before they transition to a clinical condition. Individuals with schizotypy or schizophrenia tend to experience cognitive biases. Chapter 2 described such biases, while perceptual aberrations tend to be associated with a Jumping to Perception (JTP) bias, deluded thinking tends to associate more strongly with a Jumping to Conclusion (JTC) bias. These biases have been shown to be exacerbated by emotional stimuli, particularly negative emotion. Chapter 3 discussed negative emotion and how early-age trauma can be a risk factor for schizotypy and schizophrenia. It also discussed how stress, anxiety and depression can be risk factors for the transition from schizotypy to more clinical presentations. The chapter also outlined the complex interplay between schizotypy, mood, emotion and cognitive bias.

In this study, false perceptions were examples of JTC or JTP bias, as was discussed in Chapter 4. Study I showed that the number of false perceptions reported by participants was most strongly predicted by positive schizotypy scores, as expected, but not anxiety, depression or early-age trauma; and Study II then showed that positive schizotypy was also associated with the emotional content of the words generated, particularly the Emotional Intensity, Activity and Potency ratings, though not Evaluation. Participants with lower schizotypy scores sometimes reported a small number of false perceptions, but these tended to be rated as having lower Emotional Intensity and Valence.

Although there is heterogeneity within the schizophrenia continuum with the many complex and underlying interactions, it is plausible that the false perceptions rated high in emotional content experienced by those with positive schizotypy reflect underlying psychopathology specific to schizotypy. This means that some of the

anomalous thoughts and beliefs that those with schizotypy have may impact on the content of what they see which indeed could be emotional.

Study I found that negative emotion (in this case threat-related and trauma-related words) may have affected cognitive and/or perceptual processes (the number of correct responses). However, the number of false perceptions was not affected by the emotional condition. It could be argued that that false perceptions may reflect the internal states of the participants more strongly than the actual external emotional stimuli. The underlying cognitive bias in those with schizotypy who experience false perceptions rated higher in emotion may be more strongly related to a JTP rather than JTC bias. The argument would be that these individuals may be projecting their internal state and 'seeing' words that align with it. This may be similar to the common experience that people with something on their mind may notice words relevant to this—or may mistakenly think they have seen relevant words—while reading. It is harder to explain the higher emotional content purely in terms of JTC bias, which is more about the participant 'guessing' words, though it may still be the result of a combination of JTC and JTP, where the participant guesses a word and that word has a higher emotional content due to the participant's mental state. Not all false perceptions had high emotional content, and so this study does not entirely rule out JTC bias acting alone in some of the participants.

The third main finding confirmed that there was an association between positive schizotypy and early-age trauma and between positive schizotypy and depression. As discussed in Chapter 3, the association with early-age trauma was expected and has been reported previously (Janssen et al, 2004; Spauwen et al., 2006; Johns & van Os, 2001; Holmes & Steel, 2004). It reflects the well-established association between

early-age trauma and schizophrenia, providing further support for the continuum hypothesis of schizophrenia.

Depression is common in people with schizophrenia and has been implicated as a vulnerability factor as well as a predictor of transition (Krabbendam et al., 2005). It has been proposed that genes for depression may potentiate the pathway from childhood adversity to psychotic-like experiences through dysfunctional emotional processing of anomalous experiences associated with early-age trauma (Kramer, Simons, Myin-Germeys, Jacobs, Derom...Wichers, 2011) for which depressive thoughts about the self can feed into the content of anomalous experience and help to further maintain it (Vorontsova, Garety & Freeman, 2013).

In a large college sample (n=1258) depression was more strongly associated with the positive-symptom dimension of schizotypy than negative schizotypy which is consistent with longitudinal studies that positive schizotypy is a risk factor for both mood and non-mood psychotic disorders (Lewandowski, Barrantes-vidal, Nelson-Gray, Clancy, Kepley & Kwapil, 2006). The continuity between depression and cognitive bias in positive schizotypy may lie in maladaptive schemas, low self-esteem and negative interpretations about ambiguous events and ideas about the self (Barrantes-Vidal et al., 2013).

### **6.3. Implications for clinical practice**

The study of schizotypy has resulted in useful insights to further understanding of what underpins schizophrenia (Raine, Lencz & Mednick, 1995). By identifying the risk factors that underlie schizotypy, the nature of this experience could potentially be better understood by those showing signs of risk more broadly. In this way we



can help these individuals to make sense of their experiences and offer hope rather than fear.

The results of this study suggest that non-clinical individuals with higher levels of positive schizotypy tend to be more affected by cognitive bias than those with lower levels, and that there may be a greater emotional content associated with the bias.

There are implications for identifying and treating those at risk of progressing to schizophrenia. The importance of this has been discussed. But the finding that the emotional content associated with cognitive bias is associated with higher levels of schizotypy raises a further issue for the consideration of health professionals: higher emotional content may be an indication of latent psychopathology and therefore indicative of higher risk of schizophrenia. Although a study such as this cannot confirm this directly, it may be worthy of future research and should perhaps be taken into account alongside other known risk factors.

The findings of this study have specific implications for counselling psychologists in two areas. First, Study II showed that therapists tend to have greater sensitivity to negative emotion. This is not unexpected and its implications are positive: therapists need to be sensitive to negative emotion experienced by their clients and to early warning signs of psychosis. The finding of this study suggests that through their training and/or personal characteristics they are suited to this. Second, the overall findings suggest that counselling psychologists need to be aware of clients who may have positive schizotypy, and the cognitive bias these individuals may be experiencing even if non-clinical, and to be particularly vigilant for signs of any of the risk factors for transition to schizophrenia, including early-age trauma and mood disorders.

An immediate implication of this is that the counselling psychologist may need to take positive schizotypy into account in assessing the most appropriate form of therapy for an individual, such as CBT or longer term counselling. For example, depression may be comorbid with early signs of anomalous experience, for which CBT interventions such as behaviour activation and self-esteem groups could help to stabilise depressive symptoms while providing insights into the cognitive distortions which might be underlying potentially deluded thinking. However, if trauma is implicated in the experience of early signs of psychosis then longer-term counselling and psychotherapy might be more appropriate to work with the distress before targeting psychotic phenomena.

The literature is mixed with regards to therapeutic interventions related to positive symptoms. Scepticism around the concept of psychosis has led to the generation of symptom-focused models, e.g. cognitive models of positive symptoms (Garety et al., 2001). The UK's NICE Guidelines (2009) state that CBT should be offered to everyone who presents with early signs of psychosis. However, meta-analyses have found only modest results with CBT for reductions in positive symptoms (Jauhar, McKenna, Radua, Fung, Salvador & Laws, 2014,). It is important to consider the client's subjective experience and how they make sense of their distress before considering the approach to take. Even though the NICE Guidelines recommend that a formulation should be collaborative and shared with the client, the main objective in behavioural therapy is to produce a systematic and measurable change in symptoms, and not all clients are ready for change. Indeed, some may not necessarily see their experiences as symptoms in need of altering, particularly if some of what underlies their positive symptoms is part of their personality; trying to change these symptoms could make the client feel inherently flawed. When clients

with positive symptoms are offered CBT, there is a high dropout rate (Stafford, Jackson, Mayo-Wilson, Morrison, & Kendall, 2013). The very nature of positive symptoms can also make it difficult for some clients to trust their therapist, particularly if they have also experienced trauma in the past, and this is not helped by CBT generally involving six to twelve sessions, which makes it difficult to establish a trusting therapeutic alliance.

Therefore, although CBT has its place, for some clients a longer-term therapy may help to form a therapeutic relationship where empathy and a non-judgemental stance can help them to learn to accept and understand their behaviour and experiences. This may be more suitable in a counselling relationship where the client's needs and own subjective experience take precedence over any predetermined agendas, particularly rigid ways of working with early signs of psychosis or psychosis-like experiences. The present study's results indicated that emotion may have a greater effect on the cognitive bias experienced by individuals with higher positive schizotypy scores, suggesting that a more flexible approach than CBT may prove beneficial in allowing emotion to be addressed in individuals with non-clinical positive symptoms.

The Recovery Movement, and in particular the Hearing Voices Movement, have suggested that a normal life is possible despite having aspects of psychosis such as hearing voices and that it is possible to make sense of voices within the individual's life context and to learn to live with them (Romme & Escher, 2010). When psychosis is considered to be on a continuum with the experiences of the normal population, an important distinction regarding outcome seems to be related to whether the individual treats it as a negative experience alien to themselves or rather

as a chance to recognise problems in their lives (Honig et al. 1998; Aleman & Laroi 2008). A detailed assessment would need to consider these nuances in the client's subjective experience before simply concluding CBT is the best approach. A counselling approach has more flexibility to incorporate other cognitive aspects which can be useful if clients feel it would be helpful to change underlying thinking patterns or behaviours.

According to Amering, Schmolke & Stastny (2009), recovery is more than a bottom-up movement turned into top-down mental health policy, which instead integrates concepts that have evolved internationally over a long time. Rather, recovery should bring together major stakeholders and different professional groups in mental health to overcome current conceptual reductionism and prognostic negativism that has dominated for too long. This means that the NICE guidelines (2009) may need to consider their own rigidity and cognitive bias and begin to consider other modalities of therapy where the client, rather than therapist, is expert.

#### **6.4. Limitations and future directions**

Overall the experimental method was robust. The word recognition task induced false perceptions in some participants. The emotional conditions of the target words were confirmed as valid as identified by the independent ratings in the second study and were shown to have an impact on responses. The scales used for rating the false perceptions seemed to capture the emotionality of the words, producing ratings that varied in a manner that might have been expected. However, although significant correlations were found between schizotypy and cognitive and emotional factors, cause could not be established with this particular cross-sectional design and it will

be important for future research to examine these variables longitudinally, particularly cognitive distortions including information processing biases, which not only underlie psychosis but also anxiety and depressive disorders. This could help to understand how changes in cognitive bias and affect impact on changes in schizotypy and the development of more clinical symptoms.

This is important because emotion can impact on the trajectory and presentation. For example, individuals with a higher level of depression and lower self-esteem have been found to experience hallucinations and delusions of greater severity with greater negative content than individuals without depression or lower self-esteem (Smith et al., 2006). Therefore, future studies could consider mood, self-esteem and negative beliefs when assessing and formulating patients experiences with psychosis.

A limitation of the current study is that the sample was primarily taken from university and high school students. Although participants endorsed a broad range of schizotypy, university students tend to be high functioning. Therefore, the results may not be generalisable to those who have subclinical experiences and are lower functioning. Future studies could consider studying youth in high risk areas where there is social and economic disadvantage, which is more reflective of a schizophrenia population. Thus, researchers could examine the reciprocal dimensions of cognitive biases and thinking patterns that could give rise to paranoia in the context of stress and early life adversity found in disadvantaged populations.

The fact that individuals higher in positive schizotypy experienced false perceptions rated higher in emotionality suggests there may be some underlying risk which could eventually translate into more clinical symptoms if other relevant risk factors are present. It is important that these potential risk factors are understood not just by

professionals who specialize in working with these populations, such as Early Intervention Psychosis Teams, but by health professionals in general practice who are the most likely to work with the early rather than later signs and symptoms. This study has highlighted the importance of professional experience in working with emotional content. It is recommended that assessments and treatments should be offered by experienced and properly trained clinicians who have a much broader and diverse clinical background for the importance of picking up on the many underlying potential risk factors including early-age trauma, depression and anxiety, as well as signs of schizotypy.

## **6.5. Overall conclusion**

This study has shown that individuals with positive schizotypy are more likely to experience false perceptions and that their false perceptions have a higher emotional content. The results also confirm previous findings that negative emotion may interfere with perceptual and/or cognitive processes, and that early-age trauma may be a risk factor for schizotypy. The study provides evidence that emotion-related cognitive biases are important to the study of schizotypy. Links between affect and cognitions are central to the understanding of schizophrenia and should be reflected in treatment which should consider a broader range of emotional and cognitive factors.

## Appendix I: Consent form

The following consent form was administered on-line on Qualtrics prior to the participants filling in the questionnaires.



### PARTICIPANT CONSENT FORM

**Research title:** The role of life events and unusual experiences in the emotional content of perceptions

Thank you for your interest in taking part in this study.

**Brief description:**

This research will assess your performance on an attentional task as well as examine psychological measures that might be related to that task, including life events.

The assessment of these measures will be via questionnaires available on-line. There will also be a simple computer task to be done in the lab on Whiteland's campus.

**What is the study about?**

The aim is to establish whether there is a relationship between the attentional task and your life events and any unusual experiences.

**What do I need to do?**

There are a series of questionnaires to be filled out on-line. These should not take more than 15 minutes. Afterwards, you will need to come into the lab to complete a simple computer task. This will take no longer than 15 minutes.

**What do I get?**

If you are a first year psychology student you will gain credits for your participation. Importantly, your participation will also help to advance psychological research which could help to improve people's lives. This will be explained more fully in the debriefing after the experiment, when I will be more than happy to answer any further questions you may have.

**Am I eligible to take part?**

Anyone over the age of 18

**What if I wish to withdraw?**

There is no compulsion or academic pressure to take part in the project, and if you should decline to participate or subsequently withdraw, your course marks will not be adversely affected. You may withdraw from the study at any time, without giving a reason. To do this, you will need to use the ID assigned to you. Collated data however, may still be used but your raw data will be removed from the system.

**Confidentiality**

Your data will be treated in confidence and your identity will never be revealed.

**Follow-up study**

We are looking for participants who may be eligible to take part in a follow-up to this study. This will require rating words generated in this study and should take no longer than 25 minutes. If you are selected for the follow up, you will receive an invitation letter with further information, which you can accept or decline.

Yes ☐ No ☐

**Investigator Contact Details:**

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**Consent Statement:**

I agree to take part in this research. I understand that I am free to withdraw at any point without giving a reason and that I can remove all my data from the study if I so wish leaving only the collated data. I understand that the information I provide will be treated in confidence by the investigator and that my identity will be protected in the publication of any findings.

Name .....

Signature .....

Date .....



Please note: if you have a concern about any aspect of your participation or any other queries please raise this with the investigator. If you would prefer to contact an independent party please contact the Head of Department (or if the researcher is a student you can also contact the Director of Studies).

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**2.**

## **Appendix II: Instructions**

The following instructions were shown to participants before they undertook the word recognition task.

### **INSTRUCTIONS - PLEASE READ ALL OF THE INFORMATION BELOW**

The following part of this study is a visual search task with a number of trials.

You will be presented with very brief displays of real words and non-words. Your task is to detect as many real words as you can while ignoring the non-words. For each of the trials you will need to decide whether or not a word was present. If you see a word, say it out loud. If you are not sure which word you saw, but are confident that you saw one, just say 'Not Sure'. You have a couple of seconds to do this before the next trial will automatically begin.

The best strategy in order to achieve maximum performance is to focus on the small circle in the centre before each trial, so all 4 stimuli in each trial appear within your visual field.

### **PRACTICE PHASE**

The next block of trials is a practice phase. You are going to be presented with 4 warm up trials first, to familiarise yourself with the task. After this you will enter the main phase of the experiment.

Please ONLY report REAL words. If you are not sure which word you saw but are confident you saw a word, just say 'Not Sure'

Please press OK to begin and thank you for taking part!

## Appendix III: Debrief sheets

The following are the debrief sheets for Study I and Study II

### Study I



#### Participation Debriefing

Thank you for taking part in this study: "The role of life events and unusual experiences in the emotional content of perceptions."

One of the objectives of this study is to explore the relationship between adverse experiences in childhood and "schizotypal traits". These traits exist on a continuum in the normal population. A high score for schizotypy signifies a proneness to particular personality traits present to some extent in everyone.

This study used the detection of fast moving words. In an experiment such as this, the people who score higher in schizotypy tend to see words that were not actually displayed on the screen. We were looking for any relationship between such false perceptions and unusual experiences, which is one of the scales in the measure of schizotypy.

We were also looking for possible relationships between schizotypy and life experiences, as well as trauma and depression and anxiety, particularly to see if there is a link between earlier experiences and schizotypy.

#### Contribution to knowledge

This study will contribute to a better understanding of the schizotypy continuum, and the role of trauma and negative life events in this.

#### Queries

If you have any concerns, please raise these with me (my contact details are below).

Support is also available from the University Welfare Office. Ejiro Ejoh is the student welfare officer for the Psychology Department. Ejiro will be able to advise you if you are affected by anything to do with this study, including the tasks or questionnaires you completed and any emotions these may have raised (e.ejoh@roehampton.ac.uk, 020 8392 3502).

*If you would like to receive a copy of this research once it is completed, then please contact me.*

If you have a concern about any aspect of your participation or any other queries please raise this with me. If you would prefer to contact an independent party, please contact the Head of Department (or if the researcher is a student you can also contact the Director of Studies).

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**Study II****Participation debriefing for study 2**

Thank you for taking part in this follow-up study: “The role of life events and unusual experiences in the emotional content of perceptions.”

One of the objectives of this study is to explore the relationship between adverse experiences in childhood and “schizotypal traits”. These traits exist on a continuum in the normal population. A high score for schizotypy signifies a proneness to particular personality traits present to some extent in everyone.

This study used the detection of fast moving words. In an experiment such as this, the people who score higher in schizotypy tend to see words that were not actually displayed on the screen.

This second part of the study was to establish ratings for the “words” generated in the first study.

Our hypothesis is that those who score higher on the schizotypy measure will experience a greater number of false perceptions rated high in “emotional valence”—i.e. words that carry a high emotional content.

## **Contribution to knowledge**

This study will contribute to a better understanding of the schizotypy continuum, and the role of trauma and negative life events in this.

## **Queries**

If you have any concerns, please raise these with me (my contact details are below).

Support is also available from the University Welfare Office. Ejiro Ejoh is the student welfare officer for the Psychology Department. Ejiro will be able to advise you if you are affected by anything to do with this study, including the tasks or questionnaires you completed and any emotions these may have raised (e.ejoh@roehampton.ac.uk, 020 8392 3502).

*If you would like to receive a copy of this research once it is completed, then please contact me.*

If you have a concern about any aspect of your participation or any other queries please raise this with me. If you would prefer to contact an independent party, please contact the Head of Department (or if the researcher is a student you can also contact the Director of Studies).

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## Appendix IV: List of target words

The following are the target words used in Study I, by emotional condition.

<b>Positive</b>	<b>Neutral</b>	<b>Threat-related</b>	<b>Trauma-related</b>
FUNNY	ARM	BOMB	ABUSE
GIFT	AUDIO	CRASH	ASSAULT
JOY	BALL	FIRE	ATTACK
KIND	BRUSH	FLOOD	DIRTY
NICE	MILK	HIJACK	GUILT
PRAISE	SALT	MUGGED	INVADE
SKILL	SHOP	MURDER	SEX
SUPER	SOFA	STORM	SHAME

## Appendix V: List of false perceptions

The following false perceptions were reported by participants during Study I.

ABLE	CULT	GRIEF	MIND
ABUSE	DESPAIR	GRIN	MIRROR
AGGRESSION	DITCH	HAPPY	MOIST
ANGER	DIZZY	HELEN	MOST
APE	DOWN	HURT	MOTIVE
APRIL	DRIFT	ICE	MUDDLE
ARCH	EBONY	ICING	MUSIC
ARM	EMAIL	IDEAL	NAUGHTY
ASK	EMBARRASSMENT	ILLNESS	NICE
ASPIRE	EMMA	INTENSE	NUMBER
ASSAULT	ENVY	JOB	PAGES
AUDIO	EROTIC	JOY	PAID
BALL	ERRATIC	JUNK	PASSING
BATTERY	EXIST	KIM	PRESENT
BLOWJOB	EXPLOSION	LEG	PSEUDO
BOAT	FARM	LIKE	RAPE
BONE	FIRE	LUCK	RUDE
BOW	FLED	MASHED	SAFE
BRITISH	FREEZE	MATCH	SALSA
BRUSH	FUNNY	MATH	SALT
CAGE	GET	MEMBER	SANE
CALLOUS	GRASS	MENTAL	SCAR
CHEER	GREEK	MILK	SCRUB

SENSITIVE	SOAP	TRAFFIC
SERVING	STEAL	UTOPIA
SEX	STOP	VENT
SHIP	SUICIDE	VESSEL
SHOP	SUPER	VEST
SILK	TEA	VODKA
SIN	TEETH	WATER
SKILL	TIME	WITHER
SLOW	TITANIC	YES
SMART	TOO	



## Appendix VI: Sample from the word list for Study II

The following is an excerpt from the list of target words and false perceptions given to the therapists and non-therapists to rate.

### Emotional Words

#### Instructions

Please rate each word according to the four scales.  
Then choose one of the eight categories that best represents that word.

Please provide your email address:

Age

Male/Female

#### GIFT

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

Very emotional

Not very emotional

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

Good

Bad

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

Active

Passive

☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5   ☐ 6   ☐ 7

Strong

Weak

Happiness ☐ Sadness ☐ Anger ☐ Anxiety ☐  
Fear ☐ Disgust ☐ Neutral ☐ Surprise ☐

---

## JOY

<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7
Very emotional				Not very emotional		
<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7
Good				Bad		
<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7
Active				Passive		
<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input checked="" type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7
Strong				Weak		

Happiness ☐ Sadness ☐ Anger ☐ Anxiety ☐  
Fear ☐ Disgust ☐ Neutral ☐ Surprise ☐

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